

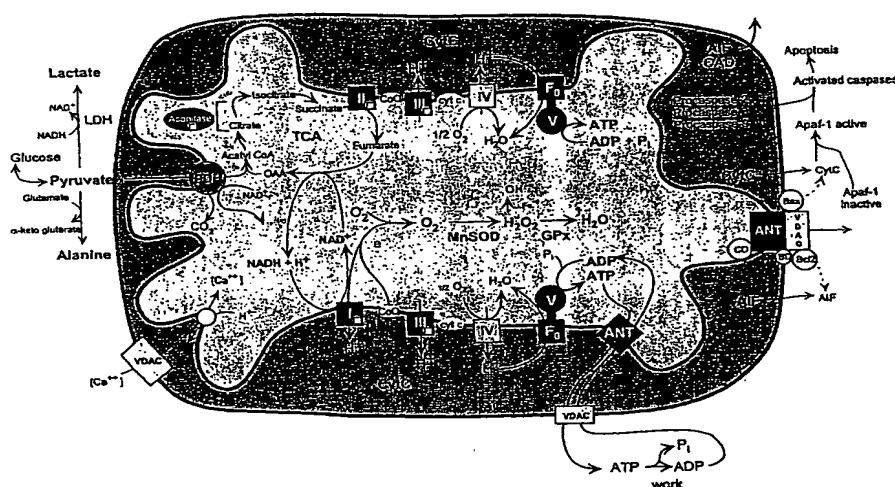


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2,356,540 31 August 2001 (31.08.2001) CA</p> <p>EMORY UNIVERSITY [US/US]; 2009 Ridgewood Drive, Atlanta, GA 30322 (US).</p> <p>WALLACE, Douglas, C. [US/US]; 2506 Echo Drive, Atlanta, GA 30345 (US). LEVY, Shawn [US/US]; 5136 Fredericksburg Way E. Brentwood TN 37027 (US). KERSTANN, Keith</p> | <p>[US/US]; 7201 Jefferson Circle N., Chamblee, GA 30341 (US). PROCACCIO, Vincent [FR/US]; 319 Valley Brook Crossing, Decatur, GA 30033 (US).</p> <p>(74) Agents: WINNER, Ellen, P. et al.; Greenlee, Winner and Sullivan, P.C., Suite 201, 5370 Manhattan Circle, Boulder, CO 80303 (US).</p> <p>(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.</p> <p>(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).</p> |
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(57) Abstract: This invention provides a library of genes involved in mitochondrial biology, arrays containing probes for genes involved in mitochondrial biology, methods for making such arrays, and methods of using such arrays. Genes and probe sequences involved in mitochondrial biology in humans and mice are provided. The arrays of this invention are useful for determining mitochondrial biology gene expression profiles. Mitochondrial biology gene expression profiles are useful for determining expression profiles diagnostic of physiological conditions; diagnosing physiological conditions; identifying biochemical pathways, genes, and mutations involved in physiological conditions; identifying therapeutic agents useful for preventing and/or treating such physiological conditions; evaluating and/or monitoring the efficacy of such therapies, and creating and identifying animal models of human physiologic conditions. Arrays containing probes for all genes known to be involved in mitochondrial biology are provided, as well as arrays containing subsets of such probes.

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MITOCHONDRIAL BIOLOGY EXPRESSION ARRAYS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Patent Application Serial No. 60/316,323 filed August 30, 2001, and to Canadian Patent Application Serial No. 2,356,540 filed August 31, 2001, both of which is hereby incorporated in their entirety by reference to the extent not inconsistent with the disclosure herein.

BACKGROUND OF THE INVENTION

Mitochondrial disorders are a complex and polygenic group of conditions with the patient's symptoms varying due to differences in energetic threshold effect of various tissues and the stochastic nature of mtDNA segregation. Consequently, most mitochondrial disorders are best classified by their genetic cause rather than a biochemical or phenotypic profile (Shoffner, J. M., and Wallace, D. C., (1995) "Oxidative phosphorylation diseases," In The Metabolic and Molecular Basis of Inherited Disease, C. R. Scriver, A. L. Beaudet, W. S. Sly and D. Valle, eds. (New York: McGraw-Hill), pp.1535-1609; Wallace, D. C., (1999) "Mitochondrial diseases in man and mouse" *Science* 283:1482-1488). Many mitochondrial diseases result from mutations in nuclear genes and a subset of these are known to act by destabilizing the mitochondrial genome. (Graham, B. et al., "A mouse model for mitochondrial myopathy and cardiomyopathy resulting from a deficiency in the heart/skeletal muscle isoform of the adenine nucleotide translocator," [1997] *Nature Genetics* 16:226-234; Shoffner, J. M., and Wallace, D.C., "Oxidative phosphorylation diseases. Disorders of two genomes," [1990] *Advances in Human Genetics* 19:267-330; Zhu, Z. et al., "SURF1, encoding a factor involved in the biogenesis of cytochrome c oxidase, is mutated in Leigh's syndrome" [1998] *Nature Genetics* 20:337-43).

The analysis of mitochondrial function in cultured cells using somatic cell genetics has been instrumental in the characterization of human mitochondrial disorders. Ethidium bromide and R-6G treatment have been used to create p0 and mitochondria-less cell lines to analyze the maternal inheritance and biochemical phenotypes of many human mtDNA mutations (Chomyn, A. et al., "In vitro genetic transfer of protein synthesis and respiration defects to mitochondrial DNA-less cells with myopathy-patient mitochondria," [1991] *Molecular and Cellular Biology* 11:2236-2244; Jun, A.S. et al., "Use of transmitochondrial cybrids to assign a complex I defect to the mitochondrial DNA-encoded NADH

dehydrogenase subunit 6 gene mutation at nucleotide pair 14459 that causes Leber hereditary optic neuropathy and dystonia," [1996] *Molecular and Cellular Biology* 16:771-777; King, M. P. et al., "Defects in mitochondrial protein synthesis and respiratory chain activity segregate with the tRNA Leu(UUR) mutation associated with mitochondrial myopathy, encephalopathy, lactic acidosis, and stroke-like episodes," [1992] *Molecular and Cellular Biology* 12:480-490; Trounce, I. et al., "Cytoplasmic transfer of the mtDNA nt 8993 TG [ATP6] point mutation associated with Leigh's syndrome into mtDNA-less cells demonstrates cosegregation with a decrease in state III respiration and ADP/O ratio," [1994] *Proc. Natl. Acad. Sci. U.S.A.* 91:8334-8338). The creation of cybrid cell lines with identical nuclear backgrounds but different mtDNA genotypes allows the comparison of one mtDNA mutant to another without the potential interference of nuclear genome polymorphisms. These cybrid lines have generally been analyzed using biochemical techniques such as assaying cellular respiration or respiratory complex specific activities by enzymology. Some gene expression studies have been performed, but they have generally been done on single or small groups of genes (Heddi, A. et al., "Mitochondrial DNA expression in mitochondrial myopathies and coordinated expression of nuclear genes involved in ATP," [1993] *J. Biological Chemistry* 268:12156-12163; Heddi, A. et al., "Coordinate induction of energy gene expression in tissues of mitochondrial disease patients" [1999] *J Biol Chem* 274:22968-76).

Gene expression has been extensively studied. Although the regulation of mRNA abundance by changes in transcription or RNA degradation is by no means the only mechanism that regulates protein levels in a cell, virtually all differences in cell type or state can be correlated to changes in the mRNA abundance of several genes (Alizadeh, A.A. et al., "Distinct types of diffuse large B-cell lymphoma identified by gene expression profiling," [2000] *Nature* 403:503-11; DeRisi, J.L. et al., "Exploring the metabolic and genetic control of gene expression on a genomic scale," [1997] *Science* 278:680-686; Schena, M. et al., "Quantitative monitoring of gene expression patterns with a complementary DNA microarray" [1995] *Science* 270:467-70; Schena, M. et al., "Parallel human genome analysis: microarray-based expression monitoring of 1000 genes" [1996] *Proc Natl Acad Sci USA* 93:10614-9; Wallace D.C., grant abstract #2R01N502328-18; Kerstann, K.W. [2000] *American Society for Human Genetics* Abstract #1484; Kokoszka, J.E. [2000] *American Society of Human Genetics* Abstract #1618; Levy, S.E. [2001] *American Society of Human Genetics* Abstract #1501; Levy, S.E. [2000] "Genetic Alteration of the Mouse Mitochondrial

Genome and Effects on Gene Expression,” Ph.D. Thesis, Emory University; Coskun, P.E. [2000] *American Society of Human Genetics* Abstract #1616; Sligh, J.E. [2000] *American Society for Human Genetics* Abstract #53; Murdock, D.G. [2000] *American Society for Human Genetics* Abstract #55; Levy S.E. [2000] *Keystone Symposia* Abstract 119; Wallace, D.C., Ellison Medical Foundation, Senior Scholar Award in Aging).

DNA microarray analysis has been used to study diffuse large B-cell lymphoma (DLBCL) where microarrays were used to expand the diagnosis of DLBCL (Alizadeh, A.A. et al., “Distinct types of diffuse large B-cell lymphoma identified by gene expression profiling,” [2000] *Nature* 403:503-11). While standard histological and morphological techniques had defined subsets of DLBCL, array analysis revealed two clinically distinct classes. These two newly discovered classes were indistinguishable by standard pathology, but expression analysis showed a differential expression of hundreds of genes. Correlation of these molecular differences with differences in the progression of the disease and clinical outcome has revealed that these two classes of DLBCL could be considered separate diseases (Alizadeh, A.A. et al., “Distinct types of diffuse large B-cell lymphoma identified by gene expression profiling,” [2000] *Nature* 403:503-11).

Mitochondrial DNA sequences have been associated with pathologies as described in U.S. patent numbers 5,670,320, 5,296,349, 5,185,244, and 5,494,794. Publications on the subject of mitochondrial biology include: Scheffler I.E. (1999) *Mitochondria*, Wiley-Liss, NY; Lestienne, P., Ed. (1999) *Mitochondrial Diseases: Models and Methods*, Springer-Verlag, Berlin; Methods in Enzymology (2000) 322:Section V Mitochondria and Apoptosis, Academic Press, CA; *Mitochondria and Cell Death* (1999) Princeton University Press, NJ; Papa S, Ferruccio G, and Tager J Eds. (1999) *Frontiers of Cellular Bioenergetics: Molecular Biology, Biochemistry, and Physiopathology*, Kluwer Academic / Plenum Publishers, NY; Lemasters J and Nieminen A (2001) *Mitochondria in Pathogenesis*, Kluwer Academic / Plenum Publishers, NY; MITOMAP, <http://www.gen.emory.edu/cgi-gin/MITOMAP>; Wallace D.C. (2001) “A mitochondrial paradigm for degenerative diseases and aging,” *Novartis Foundation Symposium* 235:247-266; Wallace DC “Mitochondrial DNA in Aging and Disease” (August 1997) *Scientific American* 277:40-47; Wallace D.C. et al., “Mitochondrial biology, degenerative diseases and aging,” (1998) *BioFactors* 7:187-190; Heddi, A. et al., “Coordinate Induction of Energy Gene Expression in Tissues of Mitochondrial Disease Patients” (1999) *JBC* 274:22968-22976; Wallace, D.C.

"Mitochondrial Diseases in Man and Mouse," (1999) *Science* 283:1482-1488; Saraste, M. "Oxidative Phosphorylation at the *fin de siecle*" (1999) *Science* 283:1488-1493; Kokoszka et al., "Increased mitochondrial oxidative stress in the Sod2 (+/-) mouse results in the age-related decline of mitochondrial function culminating in increased apoptosis," (2001) *PNAS* 98:2278-2283; Wallace, D.C. (2001) *Mental Retardation and Developmental Disabilities* 7:158-166; Wallace D.C. (2001) *Am. J. Med. Gen.* 106:71-93; and Wallace, D.C. (2001) *EuroMit 5 Abstract*.

The analysis of mitochondrial disorders has traditionally consisted of molecular and biochemical descriptions of the defect (Shoffner, J. M., and Wallace, D. C., (1995) "Oxidative phosphorylation diseases," In The Metabolic and Molecular Basis of Inherited Disease, C. R. Scriver, A. L. Beaudet, W. S. Sly and D. Valle, eds. (New York: McGraw-Hill), pp.1535-1609). Only a limited number of analyses of changes in oxidative phosphorylation (OXPHOS) genes expression have been performed in humans harboring mtDNA mutations (Heddi, A. et al., "Coordinate Induction of Energy Gene Expression in Tissues of Mitochondrial Disease Patients" (1999) *JBC* 274:22968-22976). The advent of mouse models for mitochondrial disease created by the inactivation of nuclear-encoded OXPHOS subunits has provided experimental material to study tissue-specific expression changes. (Murdock, D.G. et al., "Up-regulation of nuclear and mitochondrial genes in the skeletal muscle of mice lacking the heart/muscle isoform of the adenine nucleotide translocator," [1999] *J. Biol. Chem.* 274:14429-33.)

Nucleic acid arrays have been described, e.g., in patent nos. U.S. 5,837,832, U.S. 5,807,522, U.S. 6,007,987, U.S. 6,110,426, WO 99/05324, 99/05591, WO 00/58516, WO 95/11995, WO 95/35505A1, WO 99/42813, JP10503841T2, GR3030430T3, ES2134481T3, EP804731B1, DE69509925C0, CA2192095AA, AU2862995A1, AU709276B2, AT180570, EP 1066506, and AU 2780499. Such arrays can be incorporated into computerized methods for analyzing hybridization results when the arrays are contacted with prepared sample nucleotides, e.g., as described in PCT Publication WO 99/05574, and U.S. Patents 5,754,524; 6,228,575; 5,593,839; and 5,856,101. Methods for screening for disease markers are also known to the art, e.g., as described in U.S. Patents 6,228,586; 6,160,104; 6,083,698; 6,268,398; 6,228,578; and 6,265,174.

All references cited herein are incorporated by reference in their entirety to the extent that they are not inconsistent with the disclosure herein. Citation of the above documents is not an admission that any of them are pertinent prior art.

SUMMARY OF THE INVENTION

This invention provides a library of genes involved in mitochondrial biology, arrays containing probes for genes involved in mitochondrial biology, methods for making such arrays, and methods of using such arrays. Genes and probe sequences involved in mitochondrial biology in humans and mice are provided. The arrays of this invention are useful for determining mitochondrial biology gene expression profiles. Mitochondrial biology gene expression profiles are useful for determining expression profiles diagnostic of energy metabolism-related physiological conditions; diagnosing such physiological conditions; identifying biochemical pathways, genes, and mutations involved in such physiological conditions; identifying therapeutic agents useful for preventing and/or treating such physiological conditions; evaluating and/or monitoring the efficacy of such therapies; and creating and identifying animal models of human energy metabolism-related physiological conditions. Arrays containing probes for all genes known to be involved in mitochondrial biology are provided, as well as arrays containing subsets of such probes. The mitochondrial biology expression arrays of this invention contain probes of genes not previously recognized to participate in mitochondrial biology.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram of the mammalian mitochondrion showing mitochondrial energetics, and the relationship between energy production, reactive oxygen species (ROS) generation, and regulation of apoptosis.

FIG. 2 is a depiction of a hybridized mouse array of this invention. The picture of the hybridized array shows the image generated when the two channels representing the control or reference and experimental targets are overlaid. When viewed in color, the spots appear various shades of red, green and yellow. Red spots indicate a predominance of hybridization to control cDNAs, while green spots indicate the predominance of hybridization to the experimental target sample. Yellow spots indicate an equal hybridization of both samples. Spots that are yellow-green or orange when the array is shown in color are depicted as half yellow and green, or half red and yellow, respectively.

FIG. 3 shows the p0 LMEB4 cell line gene expression scatter plot. The scatter plot shows the distribution of gene expression ratio for the p0 LMEB4 sample. The diagonal dotted line indicates a ratio of 1 between the two samples. Any spot above the dotted line is up-regulated or more abundant in the p0 LMEB4 experimental sample compared to the LM(TK) - control. Any spot below the dotted line is down-regulated or less abundant in the experimental sample compared to the control.

FIG. 4 shows NZB heart gene expression scatter plot. The scatter plot shows the distribution of gene expression ratio for the NZB heart tissue sample. The diagonal dotted line indicates a ratio of 1 between the two samples. Any spot above the dotted line is up-regulated or more abundant in the NZB-mtDNA heart experimental sample compared to the "common" mtDNA control heart. Any spot below the dotted line is down-regulated or less abundant in the experimental sample compared to the control.

DETAILED DESCRIPTION OF THE INVENTION

An approach to examining the complex interaction between nuclear and cytoplasmic mitochondrial genes is through the use of arrays such as DNA arrays. DNA microarrays provide a means to profile the expression patterns of up to thousands of genes simultaneously, and knowing where and when a gene is expressed often provides insight into its biological function. The pattern of gene expression in a particular tissue or cell type can also provide detailed information about its state or condition.

Currently, DNA microarrays are the most efficient method to monitor correlative changes in gene expression and to investigate complex traits on a molecular level. Expression profiles assembled from multiple interrelated experiments are used to determine hierarchical connections between gene expression patterns underlying complex biological traits. These patterns are used to further define the molecular basis of complex disorders.

The mitochondrion is assembled from approximately 1000 protein-coding nuclear DNA (nDNA) and mitochondrial DNA (mtDNA) genes. Thirteen protein-coding mitochondrial genes are known, as shown in Table 1. The codon usage table of the mtDNA is known. It differs slightly from the universal code. For example, UGA codes for

tryptophan instead of termination, AUA codes for methionine instead of isoleucine, and AGA and AGG are terminators instead of coding for arginine.

Table 1

Gene	Map Locus ^a	Abbreviation	Location ^b
NADH dehydrogenase 1	MTND1	ND1	3307-4262
NADH dehydrogenase 2	MTND2	ND2	4470-5511
NADH dehydrogenase 3	MTND3	ND3	10059-10404
NADH dehydrogenase 4L	MTND4L	ND4L	10470-10766
NADH dehydrogenase 4	MTND4	ND4	10760-12137
NADH dehydrogenase 5	MTND5	ND5	12337-14148
NADH dehydrogenase 6	MTND6	ND6	14149-14673
Cytochrome b	MTCYB	Cytb	14747-15887
Cytochrome c oxidase I	MTCO1	COI	5904-7445
Cytochrome c oxidase II	MTCO2	COII	7586-8269
Cytochrome c oxidase III	MTCO3	COIII	9207-9990
ATP synthase 6	MTATP6	ATP6	8527-9207
ATP synthase 8	MTATP8	ATP8	8366-8572

^{a,b} As defined on MitoMap, <http://www.gen.emory.edu/cgi-bin/MITOMAP>, which is numbered relative to the Cambridge Sequence (Genbank accession no. J01415 and Andrews et al. (1999), A Reanalysis and Revision of the Cambridge Reference Sequence for Human Mitochondrial DNA, *Nature Genetics* 23:147.

As used herein “gene” refers to a unigene cluster, an expressed sequence, or a sequence that is transcribed and translated into a protein. Another word used in the art for “gene” is “locus.” The National Institutes of Health (NIH) have instituted the term “unigene cluster” to refer to non-redundant sets of gene clusters. A stretch of DNA may be transcribed into several splice variants that share sequences, and these would be designated as belonging to one unigene cluster. As used herein “splice variant” refers to one version of several transcripts that are transcribed from one gene. As used herein “housekeeping gene” refers to a gene that is expressed at a similar level in almost all cell types.

As used herein “genes involved in mitochondrial biology” refers to mitochondrial genes and nuclear genes involved in cellular structures and functions such as intermediary metabolism, OXPHOS, mitochondrial transport, cellular bioenergetics, cellular biogenesis,

cell cycle control, DNA replication, energy, metabolism, heat shock, stress, cellular matrix, cellular structural proteins, protein synthesis and translational control, signal transduction, transcription and transcriptional regulation, chromatin structure, reactive oxygen species (ROS) biology, and apoptosis.

“mtDNA” means mitochondrial DNA. “nDNA” means nuclear DNA.

As used herein “mitochondrial biology expression profile” refers to the expression patterns of genes involved in mitochondrial biology, such as is detected by probes derived from those genes, in a sample. The profile can be said to be of the sample or of the source from which the sample is derived. A profile may be measured independently, but a profile may also be measured relative to a standard or control or other sample. A complete mitochondrial biology expression profile includes data on all genes known to be involved in mitochondrial biology for the species from which the sample is derived. The mitochondrial biology expression profile for a selected physiological condition is at least the expression pattern of genes determined to have altered expression diagnostic of that physiological condition, but the expression pattern of additional genes involved in mitochondrial biology may also be included.

As used herein “array” refers to an ordered set of isolated nucleic acid molecules or spots consisting of pluralities of substantially identical isolated nucleic acid molecules. Preferably the molecules are attached to a substrate. The spots or molecules are ordered so that the location of each (on the substrate) is known and the identity of each is known. Arrays on a micro scale can be called microarrays. Microarrays on solid substrates, such as glass or other ceramic slides, can be called gene chips or chips.

As used herein, an “isolated nucleic acid” is a nucleic acid outside of the context in which it is found in nature. An isolated nucleic acid is a nucleic acid the structure of which is not identical to that of any naturally occurring nucleic acid molecule. The term covers, for example: (a) a DNA which has the sequence of part of a naturally-occurring genomic DNA molecule but is not flanked by both of the coding or noncoding sequences that flank that part of the molecule in the genome of the organism in which it naturally occurs; (b) a nucleic acid incorporated into a vector or into the genomic DNA of a prokaryote or eukaryote in a manner such that the resulting molecule is not identical to any naturally-occurring vector or genomic

DNA; (c) a separate molecule such as a cDNA, a genomic fragment, a fragment produced by polymerase chain reaction (PCR), or a restriction fragment; and (d) a recombinant nucleotide sequence that is part of a hybrid gene, i.e., a gene encoding a fusion protein, or a modified gene having a sequence not found in nature.

As used herein “probe” refers to an isolated nucleic acid that is suitable for hybridizing to other nucleic acids when placed on a solid substrate. Probes for arrays can be as short as 20-30 nucleotides and up to as long as several thousand nucleotides. Probes can be single-stranded or double stranded. A probe usually comprises at least a partially known sequence that is used to investigate or interrogate the presence, absence, and/or amount of a complementing sequence. On the arrays of this invention, a probe is of such a sequence and the hybridization conditions of such stringency that each probe hybridizes substantially to only one type of nucleic acid per target sample.

As used herein, “target” or “target sample” refers to the collection of nucleic acids, e.g., reverse transcribed and labeled cDNA used as a prepared sample for array analysis. The target is interrogated by the probes of the array. A “target” or “target sample” may be a mixture of several prepared samples that are combined. For example, an experimental target sample may be combined with a differently labeled control sample and hybridized to an array, the combined samples being referred to as the “target” interrogated by the probes of the array. As used herein, “interrogated” means tested. Probes, targets, and hybridization conditions are chosen such that the probes are capable of interrogating the target, i.e., of hybridizing to complementary sequences in the target sample.

As used herein “physiological condition” refers to a healthy or unhealthy physiological state. As used herein “optimize an array for diagnosis” refers to selecting probes for an array such that only probes from genes necessary for diagnosis of one or more physiological conditions are included.

As used herein “printing” refers to the process of applying probes to a solid substrate, e.g., or applying arrays of probes to a solid substrate to make a gene chip. As used herein “glass slide” refers to a small piece of glass of the same dimensions as a standard microscope slide. As used herein, “prepared substrate” refers to a substrate that is prepared with a

substance capable of serving as an attachment medium for attaching the probes to the substrate, such as poly Lysine.

As used herein “selective hybridization” refers to hybridization at moderate to high stringency such that only sequences of an appropriate homology can remain bound. Selective hybridization is hybridization performed at stringency conditions such that probes only hybridize to target sample nucleic acids that they are intended to hybridize with. Depending on the sequences of the probes and the target, the hybridization conditions are chosen to be appropriately selective. For example, if human sequences are used as probes for interrogating a human sample, selective hybridization could be at high stringency because, allowing for neutral polymorphism in humans, the sequences would be about 99-100% identical. When applying a chimpanzee target prepared sample to an array containing human sequence probes, selective hybridization would be at a lower stringency. Since hybridizing a target to an array is performed at one chosen hybridization stringency, probes are chosen so that they can undergo selective hybridization with the appropriate target molecules at the same hybridization stringency. As used herein “homology” refers to nucleotide sequence identity to a sequence, a molecule, or its complement.

As used herein “mouse sample” refers to a sample derived from a mouse or a cell line derived from a mouse. Similarly, as used herein, “human sample” refers to a sample derived from a human or a cell line derived from a human. Samples preferably contain total RNA or messenger RNA (mRNA). As used herein “total RNA” refers to a combination of several types of RNA, including mRNA, from a cell or a group of cell. As used herein, “mRNA” refers to messenger RNA or RNA that has a 3' poly A tail. As used herein, a “prepared sample” or a “target” refers to a sample that has been labeled in preparation for array hybridization. A “prepared sample” or “target” is reverse transcribed and fluorescently labeled. As used herein “standard” refers to a sample or a dataset that is commonly used for comparison to unknown samples so that the unknown samples or datasets can be standardized for comparison to each other. As used herein, “control sample” and “reference sample” refer to samples that are used for comparison against an experimental sample.

As used herein, “clone” refers to an isolated nucleic acid molecule that may be stored in an organism such as *E. coli*. A clone is usually made of a vector and an insert. The insert usually contains a sequence of interest.

For mitochondrial diseases, the accuracy of current biochemical and phenotypic techniques has proven quite limited in distinguishing and diagnosing the various disorders. Recent technical and analytical advancements make it practical to analyze and quantitate the expression patterns of thousands of genes at once using arrays such as DNA microarrays. This invention applies these array techniques to the study of mitochondrial gene expression, in the design of specialized microarrays containing genes involved in mitochondrial biology. The arrays of this invention contain probes for genes not previously recognized to participate in mitochondrial biology.

Genes, or expressed sequences, involved in mitochondrial biology are involved in cellular structures and functions such as intermediary metabolism, OXPHOS, transport, cellular bioenergetics, cellular biogenesis, cell cycle control, DNA replication, energy, metabolism, heat shock, stress, cellular matrix, cellular structural proteins, protein synthesis and translational control, signal transduction, transcription and transcriptional regulation, chromatin structure, reactive oxygen species (ROS) biology and apoptosis. Alterations in mitochondrial functions are associated with a variety of physiological conditions including degenerative diseases. These functions are involved in many degenerative diseases. This invention provides a compilation of sequences involved in human and mouse mitochondrial biology.

The genes in the arrays of this invention were identified by a variety of techniques including searching databanks for sequences related to genes involved in processes similar to mitochondrial biology such as homologues of prokaryotic genes, and screening mitochondrial mutant cell lines and animal lines for genes having altered expression patterns. When a relevant gene was identified for one species, such as the mouse, the homologue for a second species, such as human, if known, was then included on the list of genes involved in mitochondrial biology for the second species. Mitochondrial mutant cell lines are cell lines that have at least one mutation in a gene involved in mitochondrial biology.

The microarrays or gene chips of this invention comprise probes placed in known positions on a solid substrate. A useful solid substrate is a specialized glass microscope slide. The arrays of this invention include arrays containing probes that detect some or all expressed sequences involved in mitochondrial biology in a selected species.

Arrays of this invention may contain control probes as well as probes for genes involved in mitochondrial biology. Controls that can be included on the arrays of this invention include hybridization controls and scanning controls. The controls can be positive or negative controls. One type of hybridization control is spotting the same probe for a gene involved in mitochondrial biology several times on one chip, each spot having different amounts of probe. This allows for the amount of probe of a given sequence to be optimized. Spotting too little probe may lead to a maximum hybridization signal resulting in a loss of data. Dimethyl sulfoxide (DMSO) can be used as a negative hybridization and scanning control. A spot of DMSO should give no signal. If there is any signal at a DMSO spot, the problem could be at hybridization or scanning steps. Plant sequences having sufficiently low homology with human and mouse sequences can be utilized as negative hybridization and scanning controls. Plant sequences should not give any signal. A signal at a plant spot could indicate a problem with hybridization, i.e. too low a hybridization stringency was used, or with scanning, i.e., the chip was inserted into the scanner at the incorrect orientation. Poly A can be used as a positive hybridization specificity/non specificity control. A poly A spot should always give intense hybridization. No signal at a poly A spot could be the result of use of too high a hybridization stringency. Cy3 or Cy5 incorporated into a PCR product can be a positive scanning control. A spot on an array of a PCR product, or any other nucleic acid, that includes fluorescent label, should always give a signal, and if this sequence has no homology with any other sequence in the target, there should only be a signal of the label included in the nucleic acid. Control probes and probes for genes involved in mitochondrial biology can be duplicated, triplicated, etc. on the chip as printing controls. Controls for arrays can be purchased from Stratagene (SpotReportTM, La Jolla, CA, USA).

Standard targets and reference targets are also useful with the arrays of this invention, as is known in the art. When a prepared sample target to be interrogated is applied to an array of this invention, the results of the test are measured, i.e. by scanning, and recorded. These results can be compared directly to other test results using a similar array. However, it is much more accurate to include a differently labeled standard target in the hybridization mix with the prepared sample target. The results of the experimental sample target are then standardized, so that they can be compared accurately to the results of hybridizations of other sample targets. If ten different prepared sample targets are hybridized to arrays of this invention, simultaneously with the same prepared standard target, then the results of the ten

sample targets can be accurately compared to each other. A prepared reference or control target for comparison can also be particularly pertinent to the experiment being performed. A prepared reference target could be a target sample derived from the same cell type from an animal of the same sex, age, and nuclear background as the experimental target sample, except for one difference, such as a different phenotype or treatment. Comparing the results of the experimental target with the results of an appropriate reference target yields a profile associated with the one difference being tested. When the hybridization results of a first sample are compared to the hybridization results of a second sample, the comparison can occur while the hybridization results of the first sample are being measured and recorded, or afterwards, by comparing the measured and recorded hybridization results of the two samples.

Probes on an array may be as short as about 20-30 nucleotides long or as long as the entire gene or clone from which they are derived, which may be up to several kilobases. A probe sequence may be identical (have 100% homology) to the portion of the gene it hybridizes to or it may be a mutated sequence. Mutated probes have less than 100% homology, such as about 98% homology, about 95% homology, about 90% homology, about 80% homology, or about 75% homology, or less, with the portions of the genes to which they hybridize. Arrays are designed such that all probes on an array can hybridize to their corresponding genes at about the same hybridization stringency. Probes for arrays used for interrogating samples usually do not contain sequences such as repetitive sequences that would hybridize substantially with nucleic acids derived from more than one gene, i.e., transcripts or cDNAs. Probes for arrays should be unique at the hybridization stringencies used. Statistically, to be unique in the total human genome, probes should be at least about fifteen nucleotides long. A unique probe is only able to hybridize with one type of nucleic acid per target. A probe is not unique if at the hybridization stringency used, it hybridizes with nucleic acids derived from two different genes, i.e. related genes. The homology of the sequence of the probe to the gene and the hybridization stringency used help determine whether a probe is unique when testing a selected sample. Probes also may not hybridize with different nucleic acids derived from the same gene, i.e., splice variants. The location in the gene of the sequence used for the probe also helps determines whether a probe is unique when testing a selected sample. If the splice variants of a gene are known, ideally several different probes sequences are chosen from that gene for an array, such that each probe can only hybridize to nucleic acid derived from one of the splice variants. References for

sequences of probes useful for arrays of this invention are compiled in Tables 3-5 and in the sequence listings. Other equivalent probes derived from the gene sequences from which the Tables 3-5 probes are derived, are also useful for the arrays of this invention. Arrays of this invention are used at hybridization conditions allowing for selective hybridization. At conditions of selective hybridization, probes hybridize with nucleic acid from only one gene. When an array is simultaneously hybridized with two targets or two prepared samples, each probe may hybridize with a nucleic acid in each prepared sample or target. When these two nucleic acids are from the same unigene cluster, the probe is said to hybridize with one gene, despite the fact that these nucleic acids may contain different labels.

Sequences of genes involved in mitochondrial biology from other species can be used to make probes that are useful in the arrays of this invention as long as they hybridize at about the same hybridization stringency as other probes on an array. Sequences that are only able to hybridize at a substantially lower stringency, such as plant sequences, are useful as negative controls.

The arrays of this invention can be utilized to determine profiles for related species by modifying the hybridization stringency appropriately. Sequence homology between organisms is known in the art. For example, human and chimpanzee sequences are about 98% identical. Consequently, human arrays are useful for profiling chimpanzees, with an appropriate lowering of the hybridization stringency. Hybridization stringency can be lowered by modifying hybridization components such as salt concentrations and hybridization and/or wash temperatures, as is known in the art.

The sequences useful for the arrays of this invention are useful for designing arrays for other species as well. To create an array for a new organism, the known sequences from the new organism, including expressed sequence tags (ESTs), are compared, by methods known to the art, with the sequences known to already be useful for other mitochondrial biology arrays. Sequence comparisons may be performed at the nucleic acid or polypeptide level. Homologous and analogous sequences from the new organism are thereby identified and selected for the new organism's mitochondrial array. The probes on the arrays of this invention are also useful as probes for identifying candidates for the new organism's array using molecular biology techniques that are standard in the art such as screening libraries.

All sequences given herein are meant to encompass the complementary strand, as well as double-stranded polynucleotides comprising the given sequence.

Microarrays of this invention can contain as few as two probes to as many as all the probes diagnostic of the selected physiological condition to be tested. Microarrays of this invention may also contain probes for all genes involved in mitochondrial biology. The arrays of this invention may contain probes for at least about five genes, at least about ten genes, at least about twenty-five genes, at least about fifty genes, at least about 100 genes, at least about 500 genes, or at least about 1000 genes. The mouse array may contain probes for at least about 950 genes and the human array may contain probes for at least about 600 genes. Arrays of this invention may comprise more than about five spots, more than about ten spots, more than about twenty-five spots, more than about one hundred spots, more than about 500 spots, or more than about 1000 spots.

Using microarrays may require amplification of target sequences (generation of multiple copies of the same sequence) of sequences of interest, such as by PCR or reverse transcription. As the nucleic acid is copied, it is tagged with a fluorescent label that emits light like a light bulb. The labeled nucleic acid is introduced to the microarray and allowed to react for a period of time. This nucleic acid sticks to, or hybridizes, with the probes on the array when the probe is sufficiently complementary to the labeled, amplified, sample nucleic acid. The extra nucleic acid is washed off of the array, leaving behind only the nucleic acid that has bound to the probes. By obtaining an image of the array with a fluorescent scanner and using software to analyze the hybridized array image, it can be determined if, and to what extent, genes are switched on and off, or whether or not sequences are present, by comparing fluorescent intensities at specific locations on the array. The intensity of the signal indicates to what extent a sequence is present. In expression arrays, high fluorescent signals indicate that many copies of a gene are present in a sample, and lower fluorescent signal shows a gene is less active. By selecting appropriate hybridization conditions and probes, this technique is useful for detecting single nucleotide polymorphisms (SNPs) and for sequencing. Methods of designing and using microarrays are continuously being improved (Religio, A. et al. (2002) *Nuc. Acids. Res.* 30(11):e51; Iwasaki, H et al. (2002) *DNA Res.* 9(2):59-62; and Lindroos, K. et al. (2002) *Nuc. Acids. Res.* 30(14):E70).

Arrays of this invention may be made by any array synthesis methods known in the art such as spotting technology or solid phase synthesis. Preferably the arrays of this invention are synthesized by solid phase synthesis using a combination of photolithography and combinatorial chemistry. Some of the key elements of probe selection and array design are common to the production of all arrays. Strategies to optimize probe hybridization, for example, are invariably included in the process of probe selection. Hybridization under particular pH, salt, and temperature conditions can be optimized by taking into account melting temperatures and by using empirical rules that correlate with desired hybridization behaviors. Computer models may be used for predicting the intensity and concentration-dependence of probe hybridization.

Arrays, also called DNA microarrays or DNA chips, are fabricated by high-speed robotics, generally on glass but sometimes on nylon substrates, for which probes (Phimister, B. (1999) *Nature Genetics* 21s:1-60) with known identity are used to determine complementary binding. An experiment with a single DNA chip can provide researchers information on thousands of genes simultaneously. There are several steps in the design and implementation of a DNA array experiment. Many strategies have been investigated at each of these steps: 1) DNA types; 2) Chip fabrication; 3) Sample preparation; 4) Assay; 5) Readout; and 6) Software (informatics).

There are two major application forms for the array technology: 1) Determination of expression level (abundance) of genes; and 2) Identification of sequence (gene / gene mutation). There appear to be two variants of the array technology, in terms of intellectual property, of arrayed DNA sequence with known identity: Format I consists of probe cDNA (500~5,000 bases long) immobilized to a solid surface such as glass using robot spotting and exposed to a set of targets either separately or in a mixture. This method, "traditionally" called DNA microarray, is widely considered as having been developed at Stanford University. (R. Ekins and F.W. Chu "Microarrays: their origins and applications," [1999] *Trends in Biotechnology*, 17:217-218). Format II consists of an array of oligonucleotide (20~80-mer oligos) or peptide nucleic acid (PNA) probes synthesized either *in situ* (on-chip) or by conventional synthesis followed by on-chip immobilization. The array is exposed to labeled sample DNA, hybridized, and the identity/abundance of complementary sequences is determined. This method, "historically" called DNA chips, was developed at Affymetrix, Inc., which sells its photolithographically fabricated products under the GeneChip®

trademark. Many companies are manufacturing oligonucleotide-based chips using alternative *in-situ* synthesis or deposition technologies.

Probes on arrays can be hybridized with fluorescently-labeled target polynucleotides and the hybridized array can be scanned by means of scanning fluorescence microscopy. The fluorescence patterns are then analyzed by an algorithm that determines the extent of mismatch content, identifies polymorphisms, and provides some general sequencing information (M. Chee et al., [1996] *Science* 274:610). Selectivity is afforded in this system by low stringency washes to rinse away non-selectively adsorbed materials. Subsequent analysis of relative binding signals from array elements determines where base-pair mismatches may exist. This method then relies on conventional chemical methods to maximize stringency, and automated pattern recognition processing is used to discriminate between fully complementary and partially complementary binding.

Devices such as standard nucleic acid microarrays or gene chips, require data processing algorithms and the use of sample redundancy (i.e., many of the same types of array elements for statistically significant data interpretation and avoidance of anomalies) to provide semi-quantitative analysis of polymorphisms or levels of mismatch between the target sequence and sequences immobilized on the device surface. Such algorithms and software useful for statistical analysis are known to the art.

Using microarrays first requires amplification (generation of multiple copies of the same gene) of genes of interest, such as by reverse transcription. As the nucleic acid is copied, it is tagged with a fluorescent label that emits light like a light bulb. The labeled nucleic acid is introduced to the microarray and allowed to react for a period of time. This nucleic acid sticks to, or hybridizes, with the probes on the array when the probe is sufficiently complementary to the nucleic acid in the prepared sample. The extra nucleic acid is washed off of the array, leaving behind only the nucleic acid that has bound to the probes. By obtaining an image of the array with a fluorescent scanner and using software to analyze the hybridized array image, it can be determined if and to what extent genes are switched on and off, or whether or not sequences are present, by comparing fluorescent intensities at specific locations on the array. High fluorescent signals indicate that many copies of a gene are present in a prepared sample, and lower fluorescent signal shows a gene is less active. Expression levels for various genes under different conditions can be directly compared, such

as for a cancer cell and a normal cell. Similarly, it can be determined what genes are turned on and off in response to certain stimuli such as a drug. Such information is valuable because it identifies genes in disease pathways and also is predictive of either efficacy or toxicity of drugs.

Detecting a particular polymorphism can be accomplished using two probes. One probe is designed to be perfectly complementary to a target sequence, and a partner probe is generated that is identical except for a single base mismatch in its center. In the Affymetrix system, these probe pairs are called the Perfect Match probe (PM) and the Mismatch probe (MM). They allow for the quantitation and subtraction of signals caused by non-specific cross-hybridization. The difference in hybridization signals between the partners, as well as their intensity ratios, serve as indicators of specific target abundance, and consequently of the sequence.

Arrays can rely on multiple probes to interrogate individual nucleotides in a sequence. The identity of a target base can be deduced using four identical probes that vary only in the target position, each containing one of the four possible bases. Alternatively, the presence of a consensus sequence can be tested using one or two probes representing specific alleles. To genotype heterozygous or genetically mixed samples, arrays with many probes can be created to provide redundant information, resulting in unequivocal genotyping.

Probes fixed on solid substrates and targets (nucleotide sequences in the sample) are combined in a hybridization buffer solution and held at an appropriate temperature until annealing occurs. Thereafter, the substrate is washed free of extraneous materials, leaving the nucleic acids on the target bound to the fixed probe molecules allowing for detection and quantitation by methods known in the art such as by autoradiograph, liquid scintillation counting, and/or fluorescence. As improvements are made in hybridization and detection techniques, they can be readily applied by one of ordinary skill in the art. As is well known in the art, if the probe molecules and target molecules hybridize by forming a strong non-covalent bond between the two molecules, it can be reasonably assumed that the probe and target nucleic acid are essentially identical, or almost completely complementary if the annealing and washing steps are carried out under conditions of high stringency. The detectable label provides a means for determining whether hybridization has occurred.

When using oligonucleotides or polynucleotides as hybridization probes, the probes may be labeled. In arrays of this invention, the target may instead be labeled by means known to the art. Target may be labeled with radioactive or non-radioactive labels. Targets preferably contain fluorescent labels.

Various degrees of stringency of hybridization can be employed. The more stringent the conditions are, the greater the complementarity that is required for duplex formation. Stringency can be controlled by temperature, probe concentration, probe length, ionic strength, time, and the like. Hybridization experiments are often conducted under moderate to high stringency conditions by techniques well known in the art, as described, for example in Keller, G.H., and M.M. Manak (1987) *DNA Probes*, Stockton Press, New York, NY., pp. 169-170, hereby incorporated by reference. However, sequencing arrays typically use lower hybridization stringencies, as is known in the art.

Moderate to high stringency conditions for hybridization are known to the art. An example of high stringency conditions for a blot are hybridizing at 68° C in 5X SSC/5X Denhardt's solution/0.1% SDS, and washing in 0.2X SSC/0.1% SDS at room temperature. An example of conditions of moderate stringency are hybridizing at 68° C in 5X SSC/5X Denhardt's solution/0.1% SDS and washing at 42° C in 3X SSC. The parameters of temperature and salt concentration can be varied to achieve the desired level of sequence identity between probe and target nucleic acid. See, e.g., Sambrook et al. (1989) *vide infra* or Ausubel et al. (1995) Current Protocols in Molecular Biology, John Wiley & Sons, NY, NY, for further guidance on hybridization conditions.

The melting temperature is described by the following formula (Beltz, G.A. et al., [1983] Methods of Enzymology, R. Wu, L. Grossman and K. Moldave [Eds.] Academic Press, New York 100:266-285).

$$T_m = 81.50^\circ\text{C} + 16.6 \log[\text{Na}^+] + 0.41(+G+C) - 0.61(\%\text{formamide}) - 600/\text{length of duplex in base pairs.}$$

Washes can typically be carried out as follows: twice at room temperature for 15 minutes in 1X SSPE, 0.1% SDS (low stringency wash), and once at $T_m - 20^\circ\text{C}$ for 15 minutes in 0.2X SSPE, 0.1% SDS (moderate stringency wash).

Nucleic acid useful in this invention can be created by Polymerase Chain Reaction (PCR) amplification. PCR products can be confirmed by agarose gel electrophoresis. PCR is a repetitive, enzymatic, primed synthesis of a nucleic acid sequence. This procedure is well known and commonly used by those skilled in this art (see Mullis, U.S. Patent Nos. 4,683,195, 4,683,202, and 4,800,159; Saiki et al. [1985] *Science* 230:1350-1354). PCR is used to enzymatically amplify a DNA fragment of interest that is flanked by two oligonucleotide primers that hybridize to opposite strands of the target sequence. The primers are oriented with the 3' ends pointing towards each other. Repeated cycles of heat denaturation of the template, annealing of the primers to their complementary sequences, and extension of the annealed primers with a DNA polymerase result in the amplification of the segment defined by the 5' ends of the PCR primers. Since the extension product of each primer can serve as a template for the other primer, each cycle essentially doubles the amount of DNA template produced in the previous cycle. This results in the exponential accumulation of the specific target fragment, up to several million-fold in a few hours. By using a thermostable DNA polymerase such as the Taq polymerase, which is isolated from the thermophilic bacterium *Thermus aquaticus*, the amplification process can be completely automated. Other enzymes that can be used are known to those skilled in the art.

Polynucleotide sequences of the present invention can be truncated and/or mutated such that certain of the resulting fragments and/or mutants of the original full-length sequence can retain the desired characteristics of the full-length sequence. A wide variety of restriction enzymes that are suitable for generating fragments from larger nucleic acid molecules are well known. In addition, it is well known that Bal31 exonuclease can be conveniently used for time-controlled limited digestion of DNA. See, for example, Maniatis (1982) Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, New York, pages 135-139, incorporated herein by reference. See also Wei et al. (1983) *J. Biol. Chem.* 258:13006-13512. By use of Bal31 exonuclease (commonly referred to as "erase-a-base" procedures), the ordinarily skilled artisan can remove nucleotides from either or both ends of the subject nucleic acids to generate a wide spectrum of fragments that are functionally equivalent to the subject nucleotide sequences. One of ordinary skill in the art can, in this manner, generate hundreds of fragments of controlled, varying lengths from locations all along the original molecule. The ordinarily skilled artisan can routinely test or screen the generated fragments for their characteristics and determine the utility of the

fragments as taught herein. It is also well known that the mutant sequences can be easily produced with site-directed mutagenesis. See, for example, Larionov, O.A. and Nikiforov, V.G. (1982) *Genetika* 18(3):349-59; and Shortle, D. et al., (1981) *Annu. Rev. Genet.* 15:265-94, both incorporated herein by reference. The skilled artisan can routinely produce deletion-, insertion-, or substitution-type mutations and identify those resulting mutants that contain the desired characteristics of wild-type sequences, or fragments thereof.

Thus, mutational, insertional, and deletional variants of the disclosed nucleotide sequences can be readily prepared by methods which are well known to those skilled in the art. These variants can be used in the same manner as the exemplified primer sequences so long as the variants have substantial sequence homology with the original sequence. As used herein, substantial sequence homology refers to homology that is sufficient to enable the variant polynucleotide to function in the same capacity as the polynucleotide from which the probe was derived. Homology is greater than 80%, greater than 85%, greater than 90%, or greater than 95%. The degree of homology or identity needed for the variant to function in its intended capacity depends upon the intended use of the sequence. It is well within the skill of a person trained in this art to make mutational, insertional, and deletional mutations that are equivalent in function or are designed to improve the function of the sequence or otherwise provide a methodological advantage.

Percent sequence identity of two nucleic acids may be determined using the algorithm of Karlin and Altschul (1990) *Proc. Natl. Acad. Sci. USA* 87:2264-2268, modified as in Karlin and Altschul (1993) *Proc. Natl. Acad. Sci. USA* 90:5873-5877. Such an algorithm is incorporated into the NBLAST and XBLAST programs of Altschul et al. (1990) *J. Mol. Biol.* 215:402-410. BLAST nucleotide searches are performed with the NBLAST program, score = 100, wordlength = 12, to obtain nucleotide sequences with the desired percent sequence identity. To obtain gapped alignments for comparison purposes, Gapped BLAST is used as described in Altschul et al. (1997) *Nucl. Acids. Res.* 25:3389-3402. When utilizing BLAST and Gapped BLAST programs, the default parameters of the respective programs (NBLAST and XBLAST) are used. See <http://www.ncbi.nih.gov>.

Standard techniques for cloning, DNA isolation, amplification and purification, for enzymatic reactions involving DNA ligase, DNA polymerase, restriction endonucleases and the like, and various separation techniques useful herein are those known and commonly

employed by those skilled in the art. A number of standard techniques are described in Sambrook et al. (1989) *Molecular Cloning*, Second Edition, Cold Spring Harbor Laboratory, Plainview, New York; Maniatis et al. (1982) *Molecular Cloning*, Cold Spring Harbor Laboratory, Plainview, New York; Wu (ed.) (1993) *Meth. Enzymol.* 218, Part I; Wu (ed.) (1979) *Meth. Enzymol.* 68; Wu et al. (eds.) (1983) *Meth. Enzymol.* 100 and 101; Grossman and Moldave (eds.) *Meth. Enzymol.* 65; Miller (ed.) (1972) Experiments in Molecular Genetics, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York; Old and Primrose (1981) Principles of Gene Manipulation, University of California Press, Berkeley; Schleif and Wensink (1982) Practical Methods in Molecular Biology; Glover (Ed.) (1985) DNA Cloning Vol. I and II, IRL Press, Oxford, UK; Hames and Higgins (Eds.) (1985) Nucleic Acid Hybridization, IRL Press, Oxford, UK; Setlow and Hollaender (1979) Genetic Engineering: Principles and Methods, Vols. 1-4, Plenum Press, New York; and Ausubel et al. (1992) Current Protocols in Molecular Biology, Greene/Wiley, New York, NY. Abbreviations and nomenclature, where employed, are deemed standard in the field and commonly used in professional journals such as those cited herein.

The arrays of this invention are useful for defining expression signatures or profiles for mitochondrial diseases, as well as distinguishing clinical disorders that result from OXPHOS dysfunction, oxidative stress, apoptosis, and aging. The microarrays of this invention are useful for providing profiles for whole classes of mitochondrial diseases that have common underlying pathophysiological mechanisms. The data obtained from using these arrays are useful in the identification of pathways involved in these diseases and in the design of efficient therapies for treating these diseases.

The arrays of this invention are useful for determining mitochondrial biology expression profiles and for sample evaluation using those profiles. The arrays of this invention are useful for diagnosis, for identifying pathways, genes, and mutations involved in physiological conditions, for creating animal models of human physiological conditions, and for designing curative and preventative therapies and evaluating their effectiveness.

The arrays of this invention are useful for determining mitochondrial biology expression profiles of organisms, such as humans, mice, and closely related species; tissues and organs of such organisms; cell types of such organisms; and cell lines derived from such organisms. An individual can be tested at any age, including as a fetus, neonate, infant, child,

adolescent, mature adult, senior, and deceased. Using standard targets, the arrays of this invention are useful for comparing mitochondrial biology profiles of different individuals or cells.

The arrays of this invention are useful for determining the profile associated with a physiological condition such as an energy-metabolism-related physiological condition. Physiological conditions can be healthy conditions or pathological conditions. Examples of healthy conditions in humans are centenaria and physical fitness. An example of a pathological condition in humans is Leigh's syndrome (LS). By determining profiles from individuals, with and without such physiological conditions, and comparing them, the mitochondrial biology profile representative and descriptive of the physiological condition can be determined, such as for humans in Examples 4-5. Profiles can similarly be determined for cells lines with phenotypes or genotypes associated with physiological conditions, such as in Examples 13-15. Profiles can also be determined for non-human animals, including mouse strains, with physiological conditions as in Examples 8-12, 16, and 19. The arrays of this invention are useful for determining the range of normal variation of expression of genes involved in mitochondrial biology, as in Example 20. When the arrays of this invention are used to determine a profile associated with a physiological condition, prepared target samples or pooled prepared target samples, of individuals with and without the physiological condition, but otherwise similar, are hybridized to an array of this invention. The hybridization of the prepared samples are measured and compared to, if possible, determine a profile associated with the physiological condition. The profile may be optimized by statistical analysis, as is known in the art, to only contain profile data on probes necessary for diagnosing the physiological condition.

The profile associated with a physiological condition can then be used for diagnosis or evaluation using the arrays of this invention, such as in Example 7. The profile of the physiological condition can be analyzed and the analysis used to optimize an array for diagnosis of the physiological condition. An optimized array for diagnosis of a physiological condition minimally contains at least one probe for the one or more genes that have altered expression levels in the context of the physiological condition, and probes for enough genes to eliminate other likely diagnoses. Diagnosis involves collecting a sample from an individual who might have the physiological condition, and determining the profile of the prepared sample using an array of this invention, using an array containing probes for all

genes involved in mitochondrial biology or fewer probes with at least as many probes as necessary for an array optimized for diagnosis of the physiological condition. The profile of the individual is then compared to the profile of the physiological condition, and the comparison is analyzed to determine the likelihood that the individual has the physiological condition. Arrays of this invention can also be used for screening individuals who are not suspected of having the particular physiological condition. A sample is collected from such an individual, prepared, and the mitochondrial biology profile of the individual is determined using an array of this invention, e.g., an array containing probes for all genes involved in mitochondrial biology. The profile of this individual is then compared to known mitochondrial biology profiles of one or more physiological conditions that the individual may have, to determine if the profile of the individual is indicative of a diagnosable physiological condition. As demonstrated in Example 16, the arrays of this invention are also useful for detecting profiles indicative of physiological conditions before the appearance of other symptoms.

The profile of, or associated with, a physiological condition is also useful for identifying biochemical pathways affected by the physiological condition and genes involved in causation of the physiological condition. If a profile of a physiological condition demonstrates alteration in the expression of a gene, that gene is a candidate for sequencing to identify a mutation causing the physiological condition. If a profile demonstrates alteration of expression of several genes, then genes known to regulate those are candidates for sequencing to identify a mutation causing the physiological condition. Example 3 describes using the arrays of this invention for the identification of mutations associated with physiological conditions.

The profile of a physiological condition is useful for creating and/or identifying animal models of human physiological conditions. The profile of a physiological condition may suggest types of mutations, such as knockouts, to create in order to mimic the physiological condition in an animal. The arrays of this invention are also useful for screening genetically engineered or other mutated populations to identify an individual animal having a similar profile, and thus associated with the physiological condition.

The same individual can be profiled, using arrays of this invention, repeatedly over time or after exposure to various environmental conditions, thereby determining the effects of

time or exposure. Equivalent individuals can also be profiled, using the arrays of this invention, at different ages or after exposure to different environmental conditions, thereby determining the effects of time or exposure. For example, a control group of mice of a particular genotype and of a particular age can be compared, using the arrays of this invention, to a group of experimental mice of the same genotype and age, that has been exposed to a certain environmental hazard, to determine the effects of the environmental hazard. Cell lines, as well as organisms, can be profiled after exposure to different environmental conditions, as in Example 15. Arrays of this invention are also useful for determining the effects of aging. Examples 8 and 19 demonstrate differences in profiles at different ages.

Therapy is an environmental condition, the effects of which can be tested using the arrays of this invention. Identification of the pathways affected in a physiological condition allows identification of therapies useful to treat individuals having the physiological condition. For example, if profiles are determined for the effects of classes of therapeutic agents, as new physiological conditions are profiled, relevant therapeutic agents can be easily identified. The profile of a physiological condition is useful for testing candidate therapies for treating individuals with the physiological condition. An individual, with or without the physiological condition, an animal model of the physiological condition in humans, or a cell line representative of an individual with the physiological condition, can be treated with a candidate therapy. A sample for profiling is collected after treatment, prepared, the profile is determined using an array of this invention, and compared to the profile of the same individual before treatment or to equivalent individuals or cells without treatment to determine the effect of the treatment. Therapies reversing the effects of the physiological condition can thereby be identified. Preventative therapies and therapies causing desired physiological conditions can similarly be identified.

The arrays of this invention are useful for monitoring the effectiveness of a therapy for a particular individual as well as for a population. The profile of a diagnosed individual can be determined, the individual given a therapy, and then the profile of the individual determined again, using the arrays of this invention. The therapy can be modified and the profile retested, until a satisfactory treated profile is obtained.

Arrays containing probes hybridizing at moderate to high stringency with human genes involved in mitochondrial biology are used for assaying prepared samples from humans, human cell lines, and prepared samples from closely related species. Arrays containing probes hybridizing at moderate to high stringency with mouse genes involved in mitochondrial biology are used for assaying prepared samples from mice, mouse cell lines, and prepared samples from closely related species.

The arrays of this invention are made using probes for genes involved in mitochondrial biology. Probes can be selected and generated from the lists of clones and sequences in Tables 3-5, or from sequences and clones representing genes involved in mitochondrial biology not listed in these tables. Probes can be generated in vitro by nucleic acid synthesis, PCR, cloning techniques or other techniques known in the art. Flanking or vector sequence may be minimized in the probe. Probes generated from Research Genetics clones (ResGen/Invitrogen, Carlsbad, CA) can be amplified by PCR as described in Example 22. Optionally, control probes are also selected for the arrays of this invention. Examples of clones and sequences for making control probes are listed in Table 6, SEQ ID NOS:3041-3044. If housekeeping genes are chosen as positive controls, usually they are derived from the same species as the non-control probes. Housekeeping gene probes are available from Stratagene (Spot ReportTM, La Jolla, CA, USA).

Examples of housekeeping genes are shown in Table 2. Housekeeping genes generally have a consistent amount of expression in all cells. Using the arrays of this invention, the expression of the 25 housekeeping genes listed in Table 2 were compared in 4 cell lines, LMEB4, NZB, 501-1, and the LM(TK) - cell line grown in media supplemented with glucose, pyruvate, and uridine (GUP). Some variability was present between cell lines. Housekeeping genes were also tested in 6 different mouse tissue samples (brain, heart, liver, kidney, spleen and muscle) in two strains of mice, CAP^R and NZB. Variation was again present, but slight.

Table 2

Description	Functional Class
Actin-gamma	Structural gene
A272 Capping protein	Structural gene
Glyceraldehyde phosphate dehydrogenase	Metabolism-glycolysis
DNA ligase I	DNA repair/synthesis
β -actin	Structural
Alkaline Phosphatase	Unclassified
40s Ribosomal protein S15	Protein synthesis
Hypoanthine phosphoribosyl transferase (HPRT)	Metabolism-nucleotide
Ribosomal protein L15	Protein synthesis
Ribosomal Protein S29	Protein translation
Acient ubiquinating protein	Metabolism-protein
Glyceraldehyde 3-phosphate dehydrogenase	Metabolism-glycolysis
Actin- α (skeletal muscle)	Structural
Murine ornithine decarboxylase	Metabolism-amino acid
calcium binding protein Cab45	Calcium homeostasis
Ribosomal protein L1A	Protein synthesis
RNA splicing protein	RNA processing
Actin-gamma (smooth muscle)	Structural gene
E2F transcription factor	Transcriptional regulation
Ubiquitin	Unclassified
Myosin 1	Structural
HPRT	Metabolism-nucleotide
Phospholipase A2 (14-3-3 zeta/delta)	Signal transduction
HPRT	Metabolism-nucleotide
Ribosomal protein L3	Protein synthesis

Arrays can be printed on solid substrates, e.g., glass microscope slides. Before printing, slides are prepared to provide a substrate for binding as in Example 23. Arrays can be printed using any printing techniques and machines known in the art. Printing involves placing the probes on the substrate, attaching the probes to the substrate, and blocking the substrate to prevent non-specific hybridization, as described in Example 24.

Samples useful for analyses using the arrays of this invention include total RNA samples and mRNA samples. RNA samples can be prepared as described in Example 25. An RNA sample is reverse transcribed into cDNA and simultaneously labeled, i.e. with one member of a two-color fluorescent system, such as Cy3-dCTP/Cy5-dCTP as described in Example 26. The arrays are hybridized with the prepared sample and washed at appropriate

stringencies accounting for the choices of sample and probes of the array. The hybridization stringency can be higher when the probe sequence has higher homology with the gene it interrogates and when the probe is larger. A reference target, standard target, or other sample target for direct comparison may be prepared and hybridized simultaneously to the same array. A prepared sample will not degrade during hybridization and is labeled. Prepared samples are reverse transcribed and fluorescently labeled.

Hybridization results can be measured and analyzed using equipment and software available in the art as described in Example 27. Before finalizing data, preliminary results are preferably normalized by methods known in the art. An example of normalization appears in Example 29. Analysis includes determination of statistical significance. Measurement may include normalization and analysis, including statistical analysis. Resulting data are typically stored in computer files.

Mitochondrial biology expression microarrays are useful for detecting alterations in gene expression caused by alterations in mitochondrial biology. Although commercially available total genome expression arrays from companies such as Incyte Pharmaceuticals or Affymetrix contain probes for ten to twenty times as many genes as the arrays of this invention, the commercially available arrays have limitations. Several genes and probes that have been included on the arrays of this invention are not available on the commercial arrays. The commercial arrays are also very expensive and the large data sets resulting from them can be rather cumbersome to analyze and manipulate. The smaller, more focused arrays of this invention allow the expression patterns of hundreds of mitochondrial genes to be monitored quickly and efficiently. This study shows that a custom-designed microarray for mitochondrial biology expression studies, including probes for nuclear as well as mitochondrial genes, is an effective tool for the analysis of gene expression changes caused by alterations in functions resulting from a mutation in a gene involved in mitochondrial biology or other changes in metabolic state. The cell line experiments in Examples 13-17 and 20 have been particularly informative in demonstrating the specificity and sensitivity of the arrays of this invention while the mouse tissue experiments in Examples 8-12 and 16-17 have shown the consistency of the arrays of this invention.

Clones used to generate probes are listed in Tables 3-5. Clones range from about 1 kb to about 4 kb. The inserts of most clones have been sequenced on the 5' and 3' ends.

Sequences of the 5' and 3' ends of the clones are usually about 200 nt to about 800 nt and are provided herein. Probes may be generated via several methods. For example, the clones listed in Tables 3-5 may be obtained commercially, the inserts purified and used as probes. Alternatively, a 5' or 3' sequence given in the sequence listings hereof may be used to design an oligonucleotide which may be synthesized and used to probe a library to identify a cDNA or genomic clone that is equivalent to the clone used to generate the original sequence. This newly identified cDNA or genomic equivalent clone may be used to generate a probe. Alternatively, a pair of sequences from the sequence listings, representing the 5' and 3' ends of one clone, may be used to design PCR primers, which may be used to PCR amplify an isolated nucleic acid that is equivalent to the insert of the corresponding clone from which the 5' and 3' were derived. This isolated nucleic acid may be used as a probe. Probes should not contain a vector sequence that hybridizes with any sequence in a sample. Methods for designing PCR primers and designing oligonucleotides for screening libraries are known in the art.

EXAMPLES

Example 1

Human Mitochondrial Biology Array

A human mitochondrial biology array is made from clones representing 650 expressed sequences involved in mitochondrial biology. The clones used to make probes that are placed on the array are shown in Table 3 which references SEQ ID NOS:1-994 provided herein setting forth the 5' and 3' sequences from these clones. The clones identified in Table 3 are used to make a set of probes called Human Probe Set #1. Control sequences are also placed this array. Controls include, but are not limited to blanks, DMSO, probes derived from plant sequences, sequence(s) not involved in mitochondrial biology, and poly adenine (40-60 nucleotides long).

Table 3

SEQ ID NO	ResGen Clone ID	Gene	Complete Gene Name	GenBank	UniGene Cluster ID
1		mtDNA - 12S ribosome	Mitochondrial DNA 12S		
2		mtDNA - 16S ribosome	Mitochondrial DNA 16s		
3		mtDNA - ATP6	Mitochondrial DNA ATP6		
4		mtDNA - ATP8	Mitochondrial DNA ATP8		

5		mtDNA - COX1	Mitochondrial DNA COX1		
6		mtDNA - COX2	Mitochondrial DNA COX2		
7		mtDNA - COX3	Mitochondrial DNA COX3		
8		mtDNA - CYT B	Mitochondrial DNA CYTb		
9		mtDNA - ND1	Mitochondrial DNA ND1		
10		mtDNA - ND2	Mitochondrial DNA ND2		
11		mtDNA - ND3	Mitochondrial DNA ND3		
12		mtDNA - ND4	Mitochondrial DNA ND4		
13		mtDNA - ND4L	Mitochondrial DNA ND4L		
14		mtDNA - ND5	Mitochondrial DNA ND5		
15		mtDNA - ND6	Mitochondrial DNA ND6		
16	213890	DECRI	2,4-dienoyl CoA reductase	H72937	Hs.81548
17	213890	DECRI	2,4-dienoyl CoA reductase	H72938	Hs.81548
18	588911	OAS1	2',5'-oligoadenylate synthetase 1	AA146773	Hs.82396
19	588911	OAS1	2',5'-oligoadenylate synthetase 1	AA146772	Hs.82396
20	1576254	2',5'-oligoadenylate synthetase 1	2',5'-oligoadenylate synthetase 1	AA954880	Hs.82396
21	1057786	OAS2 (splice-variant)	2'-5'oligoadenylate synthetase 2	AA568217	
22	2190112	A38234	2-OXOGLUTARATE DEHYDROGENASE E1 COMPONENT	AI610813	
23	814444	CRSP9	33 kDa transcriptional co-activator	AA459244	Hs.7558
24	814444	CRSP9	33 kDa transcriptional co-activator	AA459465	Hs.7558
25	896949	HMGCR	3-hydroxy-3-methylglutaryl-Coenzyme A reductase	AA779417	
26	290111	HMGCS1	3-hydroxy-3-methylglutaryl-Coenzyme A synthase 1 (soluble)	N62195	Hs.77910
27	290111	HMGCS1	3-hydroxy-3-methylglutaryl-Coenzyme A synthase 1 (soluble)	N76492	Hs.77910
28	757222	HMGCS2	3-hydroxy-3-methylglutaryl-Coenzyme A synthase 2 (mitochondrial)	AA496148	
29	757222	HMGCS2	3-hydroxy-3-methylglutaryl-Coenzyme A synthase 2 (mitochondrial)	AA496149	
30	109310	HAAO	3-hydroxyanthranilate 3,4-dioxygenase	T80846	
31	109310	HAAO	3-hydroxyanthranilate 3,4-dioxygenase	T80921	
32	1635163	HAAO	3-hydroxyanthranilate 3,4-dioxygenase	AI005031	
33	66564	BDH	3-hydroxybutyrate dehydrogenase (heart, mitochondrial)	T67057	Hs.76893
34	66564	BDH	3-hydroxybutyrate dehydrogenase (heart, mitochondrial)	T67058	Hs.76893
35	838366	HMGCL	3-hydroxymethyl-3-methylglutaryl-Coenzyme A lyase (hydroxymethylglutaricaciduria)	AA458779	Hs.831
36	838366	HMGCL	3-hydroxymethyl-3-methylglutaryl-Coenzyme A lyase (hydroxymethylglutaricaciduria)	AA458172	Hs.831
37	28469	OXCT	3-oxoacid CoA transferase	R13381	
38	28469	OXCT	3-oxoacid CoA transferase	R40897	
39	591540	PHGDH	3-phosphoglycerate dehydrogenase	AA158735	
40	591540	PHGDH	3-phosphoglycerate dehydrogenase	AA159852	
41	266720	PDPK1	3-phosphoinositide dependent protein kinase-1	N22904	

42	266720	PDPK1	3-phosphoinositide dependent protein kinase-1	N31292	
43	666169	MTR	5-methyltetrahydrofolate-homocysteine methyltransferase	AA233640	
44	666169	MTR	5-methyltetrahydrofolate-homocysteine methyltransferase	AA233650	
45	814765	AKAP1	A kinase anchor protein, 149kD	AA454947	Hs.78921
46	814765	AKAP1	A kinase anchor protein, 149kD	AA455326	Hs.78921
47	2364633	A32422	A32422	AI744652	
48	2308263	A40487	A40487	AI671604	
49	2240514	AAP1'	AAP1'	AI637909	
50	2266774	ABF2	ABF2	AI590841	
51	36393	ACAT2	acetyl-Coenzyme A acetyltransferase 2 (acetoacetyl Coenzyme A thiolase)	R25823	
52	36393	ACAT2	acetyl-Coenzyme A acetyltransferase 2 (acetoacetyl Coenzyme A thiolase)	R46821	
53	45376	ACAA2	acetyl-Coenzyme A acyltransferase 2 (mitochondrial 3-oxoacyl-Coenzyme A thiolase)	H07926	Hs.32500
54	45376	ACAA2	acetyl-Coenzyme A acyltransferase 2 (mitochondrial 3-oxoacyl-Coenzyme A thiolase)	H08029	Hs.32500
55	262932	ACO2	Aconitase 2, mitochondrial	H99699	Hs.75900
56	366511	No Data	Actin, alpha 1, skeletal muscle	AA026609	
57	366511	No Data	Actin, alpha 1, skeletal muscle	AA026720	
58	867606	ACTB	actin, beta	AA780815	
59	428215	ACTL6	actin-like 6	AA001745	Hs. 103180
60	428215	ACTL6	actin-like 6	AA001815	Hs. 103180
61	896962	ACADS	acyl-Coenzyme A dehydrogenase, C-2 to C-3 short chain	AA676663	Hs.127610
62	298155	ACADM	Acyl-Coenzyme A dehydrogenase, C-4 to C-12 straight chain	N70794	Hs.79158
63	140131	ACADL	acyl-Coenzyme A dehydrogenase, long chain	R66005	Hs.1209
64	140131	ACADL	acyl-Coenzyme A dehydrogenase, long chain	R66006	Hs.1209
65	243100	ACADSB	acyl-Coenzyme A dehydrogenase, short/branched chain	H95792	Hs.81934
66	243100	ACADSB	acyl-Coenzyme A dehydrogenase, short/branched chain	H96140	Hs.81934
67	810358	ACADVL	Acyl-Coenzyme A dehydrogenase, very long chain	AA464163	Hs.82208
68	810358	ACADVL	Acyl-Coenzyme A dehydrogenase, very long chain	AA464228	Hs.82208
69	85450	ACOX2	acyl-Coenzyme A oxidase 2, branched chain	T71713	Hs.9795
70	85450	ACOX2	acyl-Coenzyme A oxidase 2, branched chain	T71782	Hs.9795
71	772304	ANT2	Adenine nucleotide translocator 2 (fibroblast)	AA404486	Hs.79172

72	772304	ANT2	Adenine nucleotide translocator 2 (fibroblast)	AA405477	Hs.79172
73	755855	ANT3	adenine nucleotide translocator 3 (liver)	AA496376	Hs.164280
74	755855	ANT3	adenine nucleotide translocator 3 (liver)	AA496654	Hs.164280
75	853570	ANT3	Adenine nucleotide translocator 3 (liver)	AA663439	Hs.164280
76	868757	AK1	Adenylate kinase 1	AA775325	Hs.76240
77	2010933	KAD2 HUMAN	ADENYLATE KINASE ISOENZYME 2	AI361029	
78	40026	ANT1	ADP,ATP CARRIER PROTEIN, HEART/SKELETAL MUSCLE ISOFORM T1	R53337	Hs.2043
79	40026	ANT1	ADP,ATP CARRIER PROTEIN, HEART/SKELETAL MUSCLE ISOFORM T1	R53942	Hs.2043
80	46248	ADPRT	ADP-ribosyltransferase (NAD ⁺ ; poly (ADP-ribose) polymerase)	H09923	Hs.177766
81	46248	ADPRT	ADP-ribosyltransferase (NAD ⁺ ; poly (ADP-ribose) polymerase)	H09924	Hs.177766
82	589276	AFG3L2	AFG3 (ATPase family gene 3, yeast)-like 2	AA147320	Hs.29385
83	589276	AFG3L2	AFG3 (ATPase family gene 3, yeast)-like 2	AA147413	Hs.29385
84	1018253	AIF	AIF	AA570483	
85	855624	ALDH1	aldehyde dehydrogenase 1, soluble	AA664101	Hs.76392
86	47853	ALDH4	aldehyde dehydrogenase 4 (glutamate gamma-semialdehyde dehydrogenase; pyrroline-5-carboxylate dehydrogenase)	H11346	Hs.77448
87	47853	ALDH4	aldehyde dehydrogenase 4 (glutamate gamma-semialdehyde dehydrogenase; pyrroline-5-carboxylate dehydrogenase)	H11369	Hs.77448
88	197657	ALDH5	ALDEHYDE DEHYDROGENASE, MITOCHONDRIAL X PRECURSOR	R93550	Hs.169517
89	197657	ALDH5	ALDEHYDE DEHYDROGENASE, MITOCHONDRIAL X PRECURSOR	R93551	Hs.169517
90	1917741	AOX1	aldehyde oxidase 1	AI343711	Hs.81047
91	2154324	AGPS	alkylglycerone phosphate synthase	AI445035	
92	1520618	GABT HUMAN	AMINO BUTYRATE AMINOTRANSFERASE	AA910669	
93	813651	ALAS1	aminolevulinate, delta-, synthase 1	AA447761	Hs.78712
94	813651	ALAS1	aminolevulinate, delta-, synthase 1	AA453691	Hs.78712
95	753346	ALAS2	aminolevulinate, delta-, synthase 2 (sideroblastic/hypochromic anemia)	AA406485	Hs.79103
96	753346	ALAS2	aminolevulinate, delta-, synthase 2 (sideroblastic/hypochromic anemia)	AA410346	Hs.79103
97	248631	AMT	aminomethyltransferase (glycine cleavage system protein T)	N59532	Hs.102
98	248631	AMT	aminomethyltransferase (glycine cleavage system protein T)	N78273	Hs.102
99	1556306	ANT3	ANT3	AA916851	
100	471597	API5L1	API5-like 1	AA035435	Hs.227913
101	471597	API5L1	API5-like 1	AA035436	Hs.227913
102	127032	API2	apoptosis inhibitor 2	R07870	Hs.127799
103	127032	API2	apoptosis inhibitor 2	R07927	Hs.127799

104	2285739	API3	apoptosis inhibitor 3	AI628066	
105	927606	ARAL-1	ARAL-1	AA535370	
106	1704180	XNHU DM	ASPARTATE AMINOTRANSFERASE	AI096615	
107	360778	ATM	Ataxia telangiectasia mutated (includes complementation groups A, C and D)	AA016254	Hs.194382
108	360778	ATM	Ataxia telangiectasia mutated (includes complementation groups A, C and D)	AA016988	Hs.194382
109	845519	ATP5C1	ATP SYNTHASE GAMMA CHAIN, MITOCHONDRIAL PRECURSOR	AA644234	Hs.155433
110	813712	ATP5F1	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit b, isoform 1	AA453765	Hs.181101
111	813712	ATP5F1	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit b, isoform 1	AA453849	Hs.181101
112	193106	ATP5G3	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit c (subunit 9) isoform 3	H47080	Hs.429
113	193106	ATP5G3	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit c (subunit 9) isoform 3	H47164	Hs.429
114	487373	ATP5G1	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit c (subunit 9), isoform 1	AA046701	Hs.80986
115	487373	ATP5G1	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit c (subunit 9), isoform 1	AA046489	Hs.80986
116	809876	ATP5G2	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit c (subunit 9), isoform 2	AA455126	Hs.89399
117	809876	ATP5G2	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit c (subunit 9), isoform 2	AA464312	Hs.89399
118	825312	ATP5J	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit F6	AA504540	Hs.73851
119	825312	ATP5J	ATP synthase, H ⁺ transporting, mitochondrial F0 complex, subunit F6	AA504465	Hs.73851
120	392622	ATP5B	ATP synthase, H ⁺ transporting, mitochondrial F1 complex, beta polypeptide	AA708298	Hs.25
121	856650	ATP5D	ATP synthase, H ⁺ transporting, mitochondrial F1 complex, delta subunit	AA669314	Hs.89761
122	1472150	ATP5O	ATP synthase, H ⁺ transporting, mitochondrial F1 complex, O subunit (oligomycin sensitivity conferring protein)	AA873577	Hs.76572
123	2098508	ATP2B2	ATP2B2	AI421603	Hs.89512
124	1753047	ATP50	ATP50	AI184610	
125	1173869	ATP5A1	ATP5A1	AA640573	
126	964121	ATP5C1	ATP5C1	AA507388	
127	1736058	ATP5F1	ATP5F1	AI126623	

128	307873	ATP2B4	ATPase, Ca ⁺⁺ transporting, plasma membrane 4	N93024	Hs.995
129	307873	ATP2B4	ATPase, Ca ⁺⁺ transporting, plasma membrane 4	W21376	Hs.995
130	1435103	ATP2A3	ATPase, Ca ⁺⁺ transporting, ubiquitous	AA857542	Hs.5541
131	266312	ATP7B	ATPase, Cu ⁺⁺ transporting, beta polypeptide (Wilson disease)	N26536	Hs.84999
132	266312	ATP7B	ATPase, Cu ⁺⁺ transporting, beta polypeptide (Wilson disease)	N35647	Hs.84999
133	384078	ATP6DV	ATPase, H ⁺ transporting, lysosomal (vacuolar proton pump) 31kD	AA702541	Hs.106876
134	825170	ATP6A1	ATPase, H ⁺ transporting, lysosomal (vacuolar proton pump), alpha polypeptide, 70kD, isoform 1	AA504160	Hs.255352
135	825170	ATP6A1	ATPase, H ⁺ transporting, lysosomal (vacuolar proton pump), alpha polypeptide, 70kD, isoform 1	AA504159	Hs.255352
136	1323203	ATP6B2	ATPase, H ⁺ transporting, lysosomal (vacuolar proton pump), beta polypeptide, 56/58kD, isoform 2	AA877194	Hs.1697
137	461522	ABCB7	ATP-binding cassette, sub-family B (MDR/TAP), member 7	AA705237	Hs.125856
138	1709773	MCX1	ATP-DEPENDENT CLP PROTEASE	AI131257	
139	1467799	KIAA0705	atrophin-1 interacting protein 1	AA883236	Hs.22599
140	852273	AZF1	AZF1	AA772863	
141	2367249	B42665	B42665	AI741963	
142	194384	BTF3	Basic transcription factor 3	R83000	Hs.101025
143	194384	BTF3	Basic transcription factor 3	R82957	Hs.101025
144	342181	BCL2	B-cell CLL/lymphoma 2	W63749	Hs.79241
145	342181	BCL2	B-cell CLL/lymphoma 2	W61100	Hs.79241
146	826182	BCL6	B-cell CLL/lymphoma 6 (zinc finger protein 51)	AA521434	
147	814899	BNIP3L	BCL2/adenovirus E1B 19kD-interacting protein 3-like	AA465697	Hs.132955
148	235938	BAK1	BCL2-antagonist/killer 1	H52672	
149	235938	BAK1	BCL2-antagonist/killer 1	H52673	
150	2125819	BAX	BCL2-associated X protein	AI565203	
151	1916575	BIK	BCL2-interacting killer (apoptosis-inducing)	AI347538	
152	1568561	BCL2L1	BCL2-like 1	AA931820	Hs.180372
153	2297154	BCS1	BCS1	AI670836	
154	813444	BZRP	benzodiazapine receptor (peripheral)	AA455945	Hs.202
155	813444	BZRP	benzodiazapine receptor (peripheral)	AA455554	Hs.202
156	627125	BID	BH3 interacting domain death agonist	AA190401	
157	627125	BID	BH3 interacting domain death agonist	AA190546	
158	1573108	BCKDK	branched chain alpha-ketoacid dehydrogenase kinase	AA970731	Hs.20644
159	756490	BCAT2	branched chain aminotransferase 2, mitochondrial	AA436410	Hs.101408
160	756490	BCAT2	branched chain aminotransferase 2, mitochondrial	AA481353	Hs.101408

161	740801	BCKDHA	branched chain keto acid dehydrogenase E1, alpha polypeptide (maple syrup urine disease)	AA477298	Hs.78950
162	740801	BCKDHA	branched chain keto acid dehydrogenase E1, alpha polypeptide (maple syrup urine disease)	AA477297	Hs.78950
163	770835	BCKDHB	Branched chain keto acid dehydrogenase E1, beta polypeptide (maple syrup urine disease)	AA427739	Hs.1265
164	770835	BCKDHB	Branched chain keto acid dehydrogenase E1, beta polypeptide (maple syrup urine disease)	AA434304	Hs.1265
165	129431	EST	BRCA2(?)	R11316	Hs.188591
166	129431	EST	BRCA2(?)	R11315	Hs.188591
167	83605	CPS1	carbamoyl-phosphate synthetase 1, mitochondrial	T61078	Hs.50966
168	83605	CPS1	carbamoyl-phosphate synthetase 1, mitochondrial	T61180	Hs.50966
169	1675950	CRHU5	CARBONIC ANHYDRASE V PRECURSOR	AI052226	
170	744417	CRAT	Carnitine acetyltransferase	AA621218	Hs.12068
171	133565	CPT1A	carnitine palmitoyltransferase I, liver	R28631	Hs.29331
172	133565	CPT1A	carnitine palmitoyltransferase I, liver	R32561	Hs.29331
173	415978	CPT1A	carnitine palmitoyltransferase I, liver	W85710	Hs.29331
174	415978	CPT1A	carnitine palmitoyltransferase I, liver	W86378	Hs.29331
175	120106	CASP1	caspase 1, apoptosis-related cysteine protease (interleukin 1, beta, convertase)	T95052	
176	120106	CASP1	caspase 1, apoptosis-related cysteine protease (interleukin 1, beta, convertase)	T95149	
177	30170	CASP3	caspase 3, apoptosis-related cysteine protease	R14760	
178	30170	CASP3	caspase 3, apoptosis-related cysteine protease	R42530	
179	429574	CASP3	caspase 3, apoptosis-related cysteine protease	AA011445	
180	429574	CASP3	caspase 3, apoptosis-related cysteine protease	AA011446	
181	745143	CASP6	caspase 6, apoptosis-related cysteine protease	AA626710	
182	279691	CD2AP	CD2-associated protein	N48329	Hs.30490
183	279691	CD2AP	CD2-associated protein	N49054	Hs.30490
184	1558965	CDC2L	cholinesterase-related cell division controller	AA917769	Hs.155266
185	324885	C11ORF4	chromosome 11 open reading frame 4	W48701	Hs.75859
186	324885	C11ORF4	chromosome 11 open reading frame 4	W48700	Hs.75859
187	1573778	C11ORF13	chromosome 11 open reading frame 13	AA970526	Hs.72925
188	110772	C14ORF2	chromosome 14 open reading frame 2	T90621	Hs.109052
189	110772	C14ORF2	chromosome 14 open reading frame 2	T83147	Hs.109052
190	897448	C2ORF1	chromosome 2 open reading frame 1	AA489478	Hs.14454
191	1060841	CIT1	CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR	AA568724	
192	310519	F10	COAGULATION FACTOR X PRECURSOR	N98524	Hs.47913

193	310519	F10	COAGULATION FACTOR X PRECURSOR	W31088	Hs.47913
194	436062	CPO	coproporphyrinogen oxidase (coproporphyrin, harderoporphyrin)	AA700808	Hs.89866
195	161476	COQ5	COQ5	H25602	
196	161476	COQ5	COQ5	H25556	
197	2338136	COX11.1-11.2	COX11.1-11.2	AI703310	
198	1902314	COX15.1	COX15.1	AI301929	
199	1318021	COX5A	COX5A	AA769095	
200	2326019	COX5B	COX5B	AI688757	Hs.1342
201	2301230	COX5B	COX5B	AI699318	
202	2097122	COX6A1	COX6A1	AI421088	
203	986164	COX6A2	COX6A2	AA548887	
204	2277616	COX6B	COX6B	AI690478	
205	971851	COX7A1	COX7A1	AA515958	
206	937944	COX7A2	COX7A2	AA563616	
207	2019469	CKMT1	creatine kinase, mitochondrial 1 (ubiquitous)	AI369378	Hs.153998
208	795965	CKMT2	Creatine kinase, mitochondrial 2 (sarcomeric)	AA460480	Hs.80691
209	795965	CKMT2	Creatine kinase, mitochondrial 2 (sarcomeric)	AA461048	Hs.80691
210	771327	NIFS	cysteine desulfurase	AA476245	Hs.194692
211	771327	NIFS	cysteine desulfurase	AA476244	Hs.194692
212	196189	CYB5	Cytochrome b-5	R92281	Hs.83834
213	196189	CYB5	Cytochrome b-5	R91950	Hs.83834
214	840894	COX6A1	CYTOCHROME C OXIDASE POLYPEPTIDE VIA-LIVER PRECURSOR	AA482243	Hs.180714
215	840894	COX6A1	CYTOCHROME C OXIDASE POLYPEPTIDE VIA-LIVER PRECURSOR	AA482340	Hs.180714
216	824068	COX5A	cytochrome c oxidase subunit Va	AA490735	
217	824068	COX5A	cytochrome c oxidase subunit Va	AA491224	
218	298965	COX6B	Cytochrome c oxidase subunit VIb	N71160	Hs.174031
219	298965	COX6B	Cytochrome c oxidase subunit VIb	W05541	Hs.174031
220	1472754	COX6B	cytochrome c oxidase subunit VIb	AA872391	Hs.174031
221	838568	COX6C	cytochrome c oxidase subunit VIc	AA456931	Hs.74649
222	838568	COX6C	cytochrome c oxidase subunit VIc	AA457006	Hs.74649
223	1475803	COX7A1	cytochrome c oxidase subunit VIIa polypeptide 1 (muscle)	AA872125	Hs.114346
224	1601947	COX7A2	cytochrome c oxidase subunit VIIa polypeptide 2 (liver)	AI002403	Hs.182684
225	884511	COX7B	cytochrome c oxidase subunit VIIb	AA629999	Hs.75752
226	884480	COX7C	cytochrome c oxidase subunit VIIc	AA629719	Hs.3462
227	1469230	COX8	cytochrome c oxidase subunit VIII	AA862813	Hs.81097
228	160126	COX10	Cytochrome c oxidase subunit X (heme A: farnesyltransferase)	H21868	Hs.77513
229	160126	COX10	Cytochrome c oxidase subunit X (heme A: farnesyltransferase)	H21869	Hs.77513
230	1455394	CYC1	cytochrome c-1	AA865265	Hs.697
231	194949	CYP3A7	Cytochrome P450 IIIA7 (P450-HFLa)	R91078	Hs.172323

232	194949	CYP3A7	Cytochrome P450 IIIA7 (P450-HFLa)	R91077	Hs.172323
233	1724630	S14367	CYTOCHROME P450 XIA1	AI183397	
234	85561	CYP2A7	cytochrome P450, subfamily IIA (phenobarbital-inducible), polypeptide 7	T73031	Hs.252937
235	85561	CYP2A7	cytochrome P450, subfamily IIA (phenobarbital-inducible), polypeptide 7	T72259	Hs.252937
236	246619	CYP2C8	Cytochrome P450, subfamily IIC (mephenytoin 4-hydroxylase)	N53136	
237	246619	CYP2C8	Cytochrome P450, subfamily IIC (mephenytoin 4-hydroxylase)	N58566	
238	195712	CYP2C9	Cytochrome P450, subfamily IIC (mephenytoin 4-hydroxylase), polypeptide 9	R89492	Hs.167529
239	195712	CYP2C9	Cytochrome P450, subfamily IIC (mephenytoin 4-hydroxylase), polypeptide 9	R89491	Hs.167529
240	1467195	CYP11B1	cytochrome P450, subfamily XIB (steroid 11-beta-hydroxylase), polypeptide 1	AA884709	Hs.2610
241	149737	EST	Cytochrome P450, subfamily XIX (aromatization of androgens)	H00592	Hs.141142
242	149737	EST	Cytochrome P450, subfamily XIX (aromatization of androgens)	R82738	Hs.141142
243	284620	EST	Cytochrome P450, subfamily XXI (steroid 21-hydroxylase, congenital adrenal hyperplasia)	N64794	Hs.124918
244	284620	EST	Cytochrome P450, subfamily XXI (steroid 21-hydroxylase, congenital adrenal hyperplasia)	N77388	Hs.124918
245	266146	CYP24	cytochrome P450, subfamily XXIV (vitamin D 24-hydroxylase)	N21576	Hs.89663
246	266146	CYP24	cytochrome P450, subfamily XXIV (vitamin D 24-hydroxylase)	N30976	Hs.89663
247	295843	CYP27A1	cytochrome P450, subfamily XXVIIA (steroid 27-hydroxylase, cerebrotendinous xanthomatosis), polypeptide 1	N66957	Hs.82568
248	2043415	DAPK1	death-associated protein kinase 1	AI371096	Hs.153924
249	2364396	DEHUH2	DEHUH2	AI740677	
250	125722	DGUOK	deoxyguanosine kinase	R07560	Hs.77494
251	125722	DGUOK	deoxyguanosine kinase	R07506	Hs.77494
252	2096376	S25665	DIHYDROLIPOAMIDE ACETYLTRANSFERASE COMPONENT	AI419467	
253	813648	DLD	dihydrolipoamide dehydrogenase (E3 component of pyruvate dehydrogenase complex, 2-oxo-glutarate complex, branched chain keto acid dehydrogenase complex)	AA453679	Hs.74635
254	813648	DLD	dihydrolipoamide dehydrogenase (E3 component of pyruvate dehydrogenase complex, 2-oxo-glutarate complex, branched chain keto acid dehydrogenase complex)	AA447748	Hs.74635

255	271006	DLAT	dihydrolipoamide S-acetyltransferase (E2 component of pyruvate dehydrogenase complex)	N29901	Hs.115285
256	271006	DLAT	dihydrolipoamide S-acetyltransferase (E2 component of pyruvate dehydrogenase complex)	N42953	Hs.115285
257	815564	DLST	Dihydrolipoamide S-succinyltransferase (E2 component of 2-oxo-glutarate complex)	AA456824	Hs.196416
258	815564	DLST	Dihydrolipoamide S-succinyltransferase (E2 component of 2-oxo-glutarate complex)	AA456899	Hs.196416
259	1308945	DIHYDROLIPOAMIDE SUCCINYLTRANSFERASE	DIHYDROLIPOAMIDE SUCCINYLTRANSFERASE	AA748401	
260	1308945	DIHYDROLIPOAMIDE SUCCINYLTRANSFERASE	DIHYDROLIPOAMIDE SUCCINYLTRANSFERASE	AA746285	
261	417385	Dihydroorotate dehydrogenase	Dihydroorotate dehydrogenase	W88472	Hs.125846
262	417385	Dihydroorotate dehydrogenase	Dihydroorotate dehydrogenase	W89035	Hs.125846
263	611027	dihydroorotate dehydrogenase	dihydroorotate dehydrogenase	AA173122	Hs.94925
264	611027	dihydroorotate dehydrogenase	dihydroorotate dehydrogenase	AA173225	Hs.94925
265	884539	DKFZP566D143	DKFZP566D143 protein	AA629804	
266	630013	MSH2	DNA repair protein MSH2	AA219060	Hs.78934
267	630013	MSH2	DNA repair protein MSH2	AA219061	Hs.78934
268	666425	PLCG1	DNA topoisomerase I	AA232856	Hs.317
269	666425	PLCG1	DNA topoisomerase I	AA233029	Hs.317
270	810787	HSPF1	DNAJ PROTEIN HOMOLOG 1	AA481758	Hs.82646
271	810787	HSPF1	DNAJ PROTEIN HOMOLOG 1	AA481022	Hs.82646
272	1914863	DYSF	dysferlin, limb girdle muscular dystrophy 2B (autosomal recessive)	AI310142	Hs.143897
273	773399	DMD	dystrophin (muscular dystrophy, Duchenne and Becker types), includes DXS142, DXS164, DXS206, DXS230, DXS239, DXS268, DXS269, DXS270, DXS272	AA425649	Hs.169470
274	773399	DMD	dystrophin (muscular dystrophy, Duchenne and Becker types), includes DXS142, DXS164, DXS206, DXS230, DXS239, DXS268, DXS269, DXS270, DXS272	AA427831	Hs.169470
275	796197	DMD	Dystrophin (muscular dystrophy, Duchenne and Becker types), includes DXS142, DXS164, DXS206, DXS230, DXS239, DXS268, DXS269, DXS270, DXS272	AA461118	Hs.169470

			Dystrophin (muscular dystrophy, Duchenne and Becker types), includes DXS142, DXS164, DXS206, DXS230, DXS239, DXS268, DXS269, DXS270, DXS272		
276	796197	DMD		AA461435	Hs.169470
277	781017	EGR2	early growth response 2 (Krox-20 (Drosophila) homolog)	AA446027	Hs.1395
278	781017	EGR2	early growth response 2 (Krox-20 (Drosophila) homolog)	AA446300	Hs.1395
279	180512	ENC1	ectodermal-neural cortex (with BTB-like domain)	R85090	Hs.104925
280	1744035	A31998	ELECTRON TRANSFER FLAVOPROTEIN ALPHA-SUBUNIT	AI192719	
281	2274670	S32482	ELECTRON TRANSFER FLAVOPROTEIN BETA-SUBUNIT	AI683530	
282	2267229	S62767	ELONGATION FACTOR TU	AI609398	
283	745542	ECHS1	enoyl Coenzyme A hydratase, short chain, 1, mitochondrial	AA626255	Hs.76394
284	344272	EMP3	epithelial membrane protein 3	W73810	Hs.9999
285	344272	EMP3	epithelial membrane protein 3	W73748	Hs.9999
286	253725	EST	EST	N21972	Hs.43052
287	287569	EST	EST	N62122	Hs.83313
288	287569	EST	EST	N78351	Hs.83313
289	489755	EST	EST	AA099554	Hs.246174
290	489755	EST	EST	AA101991	Hs.246174
291	609989	No Data	EST	AA169176	
292	609989	No Data	EST	AA169296	
293	511012	AGPS	EST - putative alkylglycerone phosphate synthase	AA099787	
294	511012	AGPS	EST - putative alkylglycerone phosphate synthase	AA102257	
295	449504	EST	EST, Weakly similar to predicted using Genefinder [C.elegans]	AA777928	Hs.121993
296	47005	EST	ESTs	H09825	Hs.6818
297	47005	EST	ESTs	H09920	Hs.6818
298	79655	EST	ESTs	T62655	Hs.11039
299	79655	EST	ESTs	T62509	Hs.11039
300	126229	EST	ESTs	R06313	Hs.77677
301	126229	EST	ESTs	R06258	Hs.77677
302	129606	EST	ESTs	R16545	Hs.70333
303	129606	EST	ESTs	R16603	Hs.70333
304	165837	EST	ESTs	R86713	Hs.87595
305	165837	EST	ESTs	R86712	Hs.87595
306	248669	EST	ESTs	N59553	Hs.8941
307	248669	EST	ESTs	N78295	Hs.8941
308	254004	EST	ESTs	N22302	Hs.177861
309	254004	EST	ESTs	N75187	Hs.177861
310	259462	LOC54675	ESTs	N29545	Hs.3569
311	290505	EST	ESTs	N67991	Hs.30487
312	290505	EST	ESTs	N80413	Hs.30487
313	341901	EST	ESTs	W61374	Hs.11317
314	429942	EST	ESTs	AA034062	Hs.38750
315	784214	EST	ESTs	AA446865	Hs.14018

316	784214	EST	ESTs	AA446980	Hs.14018
317	898222	EST	ESTs	AA598602	Hs.13434
318	1636741	ESTs	ESTs	AI017846	Hs.169539
319	113206	EST	ESTs, Highly similar to ARGINYL-TRNA SYNTHETASE, MITOCHONDRIAL PRECURSOR [Saccharomyces cerevisiae]	T83996	Hs.15395
320	113206	EST	ESTs, Highly similar to ARGINYL-TRNA SYNTHETASE, MITOCHONDRIAL PRECURSOR [Saccharomyces cerevisiae]	T83997	Hs.15395
321	825386	ATP5JD	ESTs, Highly similar to ATP SYNTHASE D CHAIN, MITOCHONDRIAL [Bos taurus]	AA504246	Hs.64593
322	782439	ATP5I	ESTs, Highly similar to ATP SYNTHASE E CHAIN, MITOCHONDRIAL [Cricetulus longicaudatus]	AA431433	Hs.85539
323	782439	ATP5I	ESTs, Highly similar to ATP SYNTHASE E CHAIN, MITOCHONDRIAL [Cricetulus longicaudatus]	AA431836	Hs.85539
324	434968	ATP5E	ESTs, Highly similar to ATP SYNTHASE EPSILON CHAIN, MITOCHONDRIAL PRECURSOR [Bos taurus]	AA700688	Hs.177530
325	82874	EST	ESTs, Highly similar to ATPASE INHIBITOR, MITOCHONDRIAL PRECURSOR [Rattus norvegicus]	T69273	Hs.241336
326	82874	EST	ESTs, Highly similar to ATPASE INHIBITOR, MITOCHONDRIAL PRECURSOR [Rattus norvegicus]	T69348	Hs.241336
327	290753	CS	ESTs, Highly similar to CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR [Sus scrofa]	N67639	Hs.239760
328	290753	CS	ESTs, Highly similar to CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR [Sus scrofa]	W01297	Hs.239760
329	731308	CS	ESTs, Highly similar to CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR [Sus scrofa]	AA416759	Hs.239760
330	731308	CS	ESTs, Highly similar to CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR [Sus scrofa]	AA416746	Hs.239760
331	283943	EST	ESTs, Highly similar to ELONGATION FACTOR G, MITOCHONDRIAL PRECURSOR [Rattus norvegicus]	N50802	Hs.41066
332	283943	EST	ESTs, Highly similar to ELONGATION FACTOR G, MITOCHONDRIAL PRECURSOR [Rattus norvegicus]	N55159	Hs.41066
333	359723	EST	ESTs, Highly similar to ELONGATION FACTOR G, MITOCHONDRIAL PRECURSOR [Rattus norvegicus]	AA011122	Hs.41066
334	359723	EST	ESTs, Highly similar to ELONGATION FACTOR G, MITOCHONDRIAL PRECURSOR [Rattus norvegicus]	AA010761	Hs.41066

335	430733	EST	ESTs, Highly similar to HYPOTHETICAL 16.5 KD PROTEIN IN PAS8-EGT2 INTERGENIC REGION [Saccharomyces cerevisiae]	AA677960	Hs.3585
336	1114960	ETFDH	ESTs, Highly similar to HYPOTHETICAL 29.2 KD PROTEIN IN PHD1-PTM1 INTERGENIC REGION [Saccharomyces cerevisiae]	AA602015	Hs.30661
337	1030791	EST	ESTs, Highly similar to HYPOTHETICAL 44.9 KD PROTEIN IN ERG7-NMD2 INTERGENIC REGION [Saccharomyces cerevisiae]	AA609009	Hs.63304
338	950700	PP	ESTs, Highly similar to INORGANIC PYROPHOSPHATASE [Bos taurus]	AA608572	Hs.184011
339	322218	EST	ESTs, Highly similar to ISOLEUCYL- TRNA SYNTHETASE, MITOCHONDRIAL [Saccharomyces cerevisiae]	W37993	Hs.55609
340	322218	EST	ESTs, Highly similar to ISOLEUCYL- TRNA SYNTHETASE, MITOCHONDRIAL [Saccharomyces cerevisiae]	W37992	Hs.55609
341	417801	LOC51264	ESTs, Highly similar to MITOCHONDRIAL 60S RIBOSOMAL PROTEIN L2 PRECURSOR [Saccharomyces cerevisiae]	W88752	Hs.7736
342	417801	LOC51264	ESTs, Highly similar to MITOCHONDRIAL 60S RIBOSOMAL PROTEIN L2 PRECURSOR [Saccharomyces cerevisiae]	W88848	Hs.7736
343	753602	EST	ESTs, Highly similar to MITOCHONDRIAL CARRIER PROTEIN RIM2 [Saccharomyces cerevisiae]	AA479944	Hs.42484
344	753602	EST	ESTs, Highly similar to MITOCHONDRIAL CARRIER PROTEIN RIM2 [Saccharomyces cerevisiae]	AA478847	Hs.42484
345	629916	TIM17B	ESTs, Highly similar to MITOCHONDRIAL IMPORT INNER MEMBRANE TRANSLOCASE SUBUNIT TIM17 [Saccharomyces cerevisiae]	AA219179	Hs.19105
346	629916	TIM17B	ESTs, Highly similar to MITOCHONDRIAL IMPORT INNER MEMBRANE TRANSLOCASE SUBUNIT TIM17 [Saccharomyces cerevisiae]	AA219178	Hs.19105
347	191826	EST	ESTs, Highly similar to MITOCHONDRIAL RNA SPLICING PROTEIN MRS3 [Saccharomyces cerevisiae]	H40449	Hs.34401
348	191826	EST	ESTs, Highly similar to MITOCHONDRIAL RNA SPLICING PROTEIN MRS3 [Saccharomyces cerevisiae]	H40448	Hs.34401

349	70201	EST	ESTs, Highly similar to MITOCHONDRIAL RNA SPLICING PROTEIN MSR4 [Saccharomyces cerevisiae]	T50082	Hs.34401
350	70201	EST	ESTs, Highly similar to MITOCHONDRIAL RNA SPLICING PROTEIN MSR4 [Saccharomyces cerevisiae]	T50019	Hs.34401
351	488386	EST	ESTs, Highly similar to MITOCHONDRIAL RNA SPLICING PROTEIN MSR4 [Saccharomyces cerevisiae]	AA046639	Hs.34401
352	488386	EST	ESTs, Highly similar to MITOCHONDRIAL RNA SPLICING PROTEIN MSR4 [Saccharomyces cerevisiae]	AA046778	Hs.34401
353	611467	NDUFS6	ESTs, Highly similar to MITOCHONDRIAL TRIFUNCTIONAL ENZYME ALPHA SUBUNIT PRECURSOR [Homo sapiens]	AA176453	Hs.49767
354	611467	NDUFS6	ESTs, Highly similar to MITOCHONDRIAL TRIFUNCTIONAL ENZYME ALPHA SUBUNIT PRECURSOR [Homo sapiens]	AA176931	Hs.49767
355	179336	SDHA	ESTs, Highly similar to SUCCINATE DEHYDROGENASE [Homo sapiens]	H50345	Hs.469
356	179336	SDHA	ESTs, Highly similar to SUCCINATE DEHYDROGENASE [Homo sapiens]	H50378	Hs.469
357	843335	SUCLG1	ESTs, Highly similar to SUCCINYL- COA LIGASE [Rattus norvegicus]	AA485965	Hs.7043
358	843335	SUCLG1	ESTs, Highly similar to SUCCINYL- COA LIGASE [Rattus norvegicus]	AA489575	Hs.7043
359	825229	LOC51017	ESTs, Highly similar to CGI-113 protein [H.sapiens]	AA504139	Hs.19077
360	825229	LOC51017	ESTs, Highly similar to CGI-113 protein [H.sapiens]	AA504401	Hs.19077
361	814271	Est	ESTs, Highly similar to CGI-116 protein [H.sapiens]	AA459002	Hs.18885
362	814271	Est	ESTs, Highly similar to CGI-116 protein [H.sapiens]	AA459222	Hs.18885
363	811062	LOC51629	ESTs, Highly similar to CGI-69 protein [H.sapiens]	AA485441	Hs.237924
364	811062	LOC51629	ESTs, Highly similar to CGI-69 protein [H.sapiens]	AA485607	Hs.237924
365	417803	EST	ESTs, Highly similar to hypothetical protein [H.sapiens]	W88753	Hs.166406
366	417803	EST	ESTs, Highly similar to hypothetical protein [H.sapiens]	W88859	Hs.166406
367	878316	ESTs	ESTs, Highly similar to small zinc finger- like protein [H.sapiens]	AA670296	Hs.109571
368	504689	EST	ESTs, Moderately similar to 3- OXOACYL-[ACYL-CARRIER- PROTEIN] SYNTHASE II [Escherichia coli]	AA149172	Hs.55781

369	504689	EST	ESTs, Moderately similar to 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE II [Escherichia coli]	AA149171	Hs.55781
370	238907	D6S52E	ESTs, Moderately similar to ABC1 PROTEIN PRECURSOR [Saccharomyces cerevisiae]	H67876	Hs.243960
371	238907	D6S52E	ESTs, Moderately similar to ABC1 PROTEIN PRECURSOR [Saccharomyces cerevisiae]	H67202	Hs.243960
372	435314	EST	ESTs, Moderately similar to 5-AMINOLEVULINIC ACID SYNTHASE MITOCHONDRIAL PRECURSOR, ERYTHROID-SPECIFIC [H.sapiens]	AA699919	Hs.114018
373	839027	EST	ESTs, Moderately similar to CGI-24 protein [H.sapiens]	AA487499	
374	839027	EST	ESTs, Moderately similar to CGI-24 protein [H.sapiens]	AA487715	
375	321354	EST	ESTs, Moderately similar to MSG1-related protein [H.sapiens]	W32403	Hs.18349
376	321354	EST	ESTs, Moderately similar to MSG1-related protein [H.sapiens]	W32980	Hs.18349
377	824911	EST	ESTs, Weakly similar to /prediction	AA489022	Hs.5080
378	824911	EST	ESTs, Weakly similar to /prediction	AA489118	Hs.5080
379	85384	EST	ESTs, Weakly similar to anon2A5 [D.melanogaster]	T71965	Hs.10964
380	85384	EST	ESTs, Weakly similar to anon2A5 [D.melanogaster]	T72105	Hs.10964
381	757265	EST	ESTs, Weakly similar to aralar1 [H.sapiens]	AA426113	Hs.183047
382	490753	FLJ20420	ESTs, Weakly similar to head-elevated expression in 0.9 kb [D.melanogaster]	AA133166	Hs.6693
383	343555	EST	ESTs, Weakly similar to mitochondrial inner membrane protease 1 [S.cerevisiae]	W69379	Hs.62669
384	343555	EST	ESTs, Weakly similar to mitochondrial inner membrane protease 1 [S.cerevisiae]	W69378	Hs.62669
385	198312	KIAA0719	ESTs, Weakly similar to MITOCHONDRIAL PRECURSOR PROTEINS IMPORT RECEPTOR [Neurospora crassa]	R94191	Hs.21198
386	198312	KIAA0719	ESTs, Weakly similar to MITOCHONDRIAL PRECURSOR PROTEINS IMPORT RECEPTOR [Neurospora crassa]	R94290	Hs.21198
387	511257	KIAA0719	ESTs, Weakly similar to MITOCHONDRIAL PRECURSOR PROTEINS IMPORT RECEPTOR [Neurospora crassa]	AA088722	Hs.21198
388	511257	KIAA0719	ESTs, Weakly similar to MITOCHONDRIAL PRECURSOR PROTEINS IMPORT RECEPTOR [Neurospora crassa]	AA088799	Hs.21198

389	324651	EST	ESTs, Weakly similar to MITOCHONDRIAL RESPIRATORY FUNCTION PROTEIN 1 [<i>Saccharomyces cerevisiae</i>]	W47099	Hs.19513
390	324651	EST	ESTs, Weakly similar to MITOCHONDRIAL RESPIRATORY FUNCTION PROTEIN 1 [<i>Saccharomyces cerevisiae</i>]	W47223	Hs.19513
391	429222	EST	ESTs, Weakly similar to MSF1 PROTEIN [<i>S.cerevisiae</i>]	AA004210	Hs.3945
392	429222	EST	ESTs, Weakly similar to MSF1 PROTEIN [<i>S.cerevisiae</i>]	AA007411	Hs.3945
393	754537	EST	ESTs, Weakly similar to myosin beta heavy chain, cardiac and skeletal muscle [<i>H.sapiens</i>]	AA406291	
394	754537	EST	ESTs, Weakly similar to myosin beta heavy chain, cardiac and skeletal muscle [<i>H.sapiens</i>]	AA421979	
395	897557	EST	ESTs, Weakly similar to myosin beta heavy chain, cardiac and skeletal muscle [<i>H.sapiens</i>]	AA497024	Hs.179817
396	897557	EST	ESTs, Weakly similar to myosin beta heavy chain, cardiac and skeletal muscle [<i>H.sapiens</i>]	AA489606	Hs.179817
397	812169	EST	ESTs, Weakly similar to PROBABLE MITOCHONDRIAL 40S RIBOSOMAL PROTEIN S5 [<i>S.cerevisiae</i>]	AA456042	Hs.7807
398	208531	EST	ESTs, Weakly similar to PUTATIVE MITOCHONDRIAL CARRIER YBR291C [<i>Saccharomyces cerevisiae</i>]	H61979	Hs.7994
399	208531	EST	ESTs, Weakly similar to PUTATIVE MITOCHONDRIAL CARRIER YBR291C [<i>Saccharomyces cerevisiae</i>]	H61978	Hs.7994
400	435509	tRNA ^{Leu}	ESTs, Weakly similar to similar to leucyl-tRNA synthetase [<i>C.elegans</i>]	AA701379	
401	43662	EST	ESTs, Weakly similar to similar to mitochondrial carrier protein [<i>C.elegans</i>]	H05645	Hs.21262
402	43662	EST	ESTs, Weakly similar to similar to mitochondrial carrier protein [<i>C.elegans</i>]	H05644	Hs.21262
403	53385	EST	ESTs, Weakly similar to Similar to NAD(P) transhydrogenase, mitochondrial [<i>C.elegans</i>]	R16231	Hs.106620
404	53385	EST	ESTs, Weakly similar to Similar to NAD(P) transhydrogenase, mitochondrial [<i>C.elegans</i>]	R16232	Hs.106620
405	84880	EST	ESTs, Weakly similar to VISC PROTEIN [<i>Escherichia coli</i>]	T74882	Hs.12239
406	84880	EST	ESTs, Weakly similar to VISC PROTEIN [<i>Escherichia coli</i>]	T74939	Hs.12239
407	845419	FANCA	Fanconi anemia, complementation group A	AA644129	Hs.86297
408	624634	FDX1	ferredoxin 1	AA187349	Hs.744
409	624634	FDX1	ferredoxin 1	AA188427	Hs.744
410	365149	FECH	ferrochelatase (protoporphyrin)	AA025142	Hs.26

411	365149	FECH	ferrochelatase (protoporphyrin)	AA025157	Hs.26
412	1469138	FGA	Fibrinogen, A alpha polypeptide	AA865707	Hs.90765
413	131839	FOLR1	folate receptor 1 (adult)	R24635	Hs.73769
414	131839	FOLR1	folate receptor 1 (adult)	R24530	Hs.73769
415	146605	FPRL1	formyl peptide receptor-like 1	R80041	Hs.99855
416	146605	FPRL1	formyl peptide receptor-like 1	R79948	Hs.99855
417	490600	FOSL2	FOS-like antigen 2	AA101617	Hs.155210
418	490600	FOSL2	FOS-like antigen 2	AA101616	Hs.155210
419	279790	FMR1	Fragile X mental retardation 1	N48355	Hs.89764
420	279790	FMR1	Fragile X mental retardation 1	N49132	Hs.89764
421	669419	FRDA	Friedreich ataxia	AA253413	Hs.95998
422	669419	FRDA	Friedreich ataxia	AA253388	Hs.95998
423	469412	FH	Fumarate hydratase	AA026917	Hs.75653
424	469412	FH	Fumarate hydratase	AA026918	Hs.75653
425	842839	FUS	fusion, derived from t(12;16) malignant liposarcoma	AA486284	
426	842839	FUS	fusion, derived from t(12;16) malignant liposarcoma	AA489305	
427	81289	ACTG2	Gamma-actin, enteric smooth muscle form	T60048	Hs.77443
428	288663	GJB1	gap junction protein, beta 1, 32kD (connexin 32, Charcot-Marie-Tooth neuropathy, X-linked)	N62394	
429	288663	GJB1	gap junction protein, beta 1, 32kD (connexin 32, Charcot-Marie-Tooth neuropathy, X-linked)	N79360	
430	2338827	GCDH HUMAN	GCDH HUMAN	AI693352	
431	66534	GCKR	glucokinase (hexokinase 4) regulatory protein	T67007	Hs.89771
432	66534	GCKR	glucokinase (hexokinase 4) regulatory protein	T67006	Hs.89771
433	471498	GNS	glucosamine (N-acetyl)-6-sulfatase (Sanfilippo disease IIID)	AA035347	Hs.2703
434	122636	G6PC	Glucose-6-phosphatase	T98886	Hs.242
435	122636	G6PC	Glucose-6-phosphatase	T98887	Hs.242
436	166236	G6PD	glucose-6-phosphate dehydrogenase	R87497	
437	166236	G6PD	glucose-6-phosphate dehydrogenase	R88192	
438	753775	GMPR	Glucose-6-phosphate dehydrogenase	AA406242	Hs.1435
439	753775	GMPR	Glucose-6-phosphate dehydrogenase	AA410375	Hs.1435
440	361565	GLUD1	glutamate dehydrogenase 1	AA018372	Hs.77508
441	361565	GLUD1	glutamate dehydrogenase 1	AA017175	Hs.77508
442	51702	GOT1	glutamic-oxaloacetic transaminase 1, soluble (aspartate aminotransferase 1)	H22856	Hs.597
443	51702	GOT1	glutamic-oxaloacetic transaminase 1, soluble (aspartate aminotransferase 1)	H22855	Hs.597
444	841370	GOT2	Glutamic-oxaloacetic transaminase 2, mitochondrial (aspartate aminotransferase 2)	AA487739	Hs.170197
445	841370	GOT2	Glutamic-oxaloacetic transaminase 2, mitochondrial (aspartate aminotransferase 2)	AA487521	Hs.170197
446	810999	GPX1	glutathione peroxidase 1	AA485362	Hs.76686
447	810999	GPX1	glutathione peroxidase 1	AA485517	Hs.76686

448	587847	GPX2	Glutathione peroxidase 2, gastrointestinal	AA135289	Hs.2704
449	587847	GPX2	Glutathione peroxidase 2, gastrointestinal	AA135152	Hs.2704
450	855523	GPX3	Glutathione peroxidase 3 (plasma)	AA664180	Hs.172153
451	1555659	GPX3	glutathione peroxidase 3 (plasma)	AI147534	Hs.172153
452	448619	GSR	Glutathione reductase	AA777289	Hs.121524
453	811792	GSS	Glutathione synthetase	AA463458	Hs.82327
454	628418	GPD1	glycerol-3-phosphate dehydrogenase 1 (soluble)	AA192547	Hs.255718
455	628418	GPD1	glycerol-3-phosphate dehydrogenase 1 (soluble)	AA193116	Hs.255718
456	428756	GPD2	glycerol-3-phosphate dehydrogenase 2 (mitochondrial)	AA005219	Hs.93201
457	428756	GPD2	glycerol-3-phosphate dehydrogenase 2 (mitochondrial)	AA005218	Hs.93201
458	42558	GATM	glycine amidinotransferase (L-arginine:glycine amidinotransferase)	R61229	Hs.75335
459	42558	GATM	glycine amidinotransferase (L-arginine:glycine amidinotransferase)	R61228	Hs.75335
460	134748	GCSH	glycine cleavage system protein H (aminomethyl carrier)	R28294	Hs.77631
461	134748	GCSH	glycine cleavage system protein H (aminomethyl carrier)	R28081	Hs.77631
462	248261	GLDC	glycine dehydrogenase (decarboxylating; glycine decarboxylase, glycine cleavage system protein P)	N78083	Hs.27
463	248261	GLDC	glycine dehydrogenase (decarboxylating; glycine decarboxylase, glycine cleavage system protein P)	N58494	Hs.27
464	45632	GYS1	glycogen synthase 1 (muscle)	H08446	Hs.772
465	45632	GYS1	glycogen synthase 1 (muscle)	H08732	Hs.772
466	245920	GYS2	glycogen synthase 2 (liver)	N72934	Hs.82614
467	245920	GYS2	glycogen synthase 2 (liver)	N52282	Hs.82614
468	1502027	MGE1	GrpE-like protein cochaperone mRNA	AA887226	
469	2250688	GT	GT	AI659294	
470	841008	GBP1	Guanylate binding protein 1, interferon-inducible, 67kD	AA486849	Hs.62661
471	841008	GBP1	Guanylate binding protein 1, interferon-inducible, 67kD	AA486850	Hs.62661
472	796341	CLCN3	H. sapiens RNA for CLCN3	AA461332	Hs.174139
473	796341	CLCN3	H. sapiens RNA for CLCN3	AA459750	Hs.174139
474	300237	No Data	H.sapiens DAP-3 mRNA	N78611	
475	300237	No Data	H.sapiens DAP-3 mRNA	W07332	
476	341246	CLPP	H.sapiens mRNA for CLPP	W58658	Hs.74362
477	341246	CLPP	H.sapiens mRNA for CLPP	W58337	Hs.74362
478	1031185	MCSP	H.sapiens mRNA for mitochondrial capsule selenoprotein	AA609976	Hs.111850
479	259842	PMPCB	H.sapiens mRNA for M-phase phosphoprotein, mpp11	N29844	Hs.184211
480	259842	PMPCB	H.sapiens mRNA for M-phase phosphoprotein, mpp11	N57262	Hs.184211
481	810942	IDH3G	H.sapiens mRNA for NAD (H)-specific isocitrate dehydrogenase gamma subunit precursor	AA459380	Hs.75253

482	810942	IDH3G	H.sapiens mRNA for NAD (H)-specific isocitrate dehydrogenase gamma subunit precursor	AA459606	Hs.75253
483	530282	NDUFA1	H.sapiens mRNA for NADH dehydrogenase	AA111999	Hs.74823
484	530282	NDUFA1	H.sapiens mRNA for NADH dehydrogenase	AA083784	Hs.74823
485	813815	NR1I3	H.sapiens mRNA for orphan nuclear hormone receptor	AA447727	Hs.83623
486	813815	NR1I3	H.sapiens mRNA for orphan nuclear hormone receptor	AA447889	Hs.83623
487	810959	ARHGDIA	H.sapiens mRNA for rho GDP-dissociation Inhibitor 1	AA459400	Hs.159161
488	810959	ARHGDIA	H.sapiens mRNA for rho GDP-dissociation Inhibitor 1	AA459625	Hs.159161
489	506032	TIM17	H.sapiens mRNA for TIM17 preprotein translocase	AA708446	Hs.20716
490	814526	EST	H.sapiens seb4D mRNA	AA459363	
491	814526	EST	H.sapiens seb4D mRNA	AA459588	
492	814460	SURF5	H.sapiens SURF-5 mRNA	AA459247	Hs.78354
493	814460	SURF5	H.sapiens SURF-5 mRNA	AA459472	Hs.78354
494	1671299	HRK	harakiri, BCL2-interacting protein (contains only BH3 domain)	AI083676	Hs.87247
495	1417985	EST	heat shock 10kD protein 1 (chaperonin 10)	AA878786	Hs.203620
496	1417985	EST	heat shock 10kD protein 1 (chaperonin 10)	AI791247	Hs.203620
497	1870305	HSPB2	heat shock 27kD protein 2	AI245337	Hs.78846
498	1354618	HSPF2	heat shock 40kD protein 2	AA830392	Hs.172847
499	755904	HSPA1A	HEAT SHOCK 70 KD PROTEIN 1	AA496544	Hs.8997
500	1604342	HSPA9B	heat shock 70kD protein 9B (mortalin-2)	AA987644	Hs.3069
501	884719	HSPA10	HEAT SHOCK COGNATE 71 KD PROTEIN	AA629567	Hs.180414
502	253009	HSPCA	HEAT SHOCK PROTEIN HSP 90-ALPHA	H88540	Hs.180532
503	253009	HSPCA	HEAT SHOCK PROTEIN HSP 90-ALPHA	H88588	Hs.180532
504	824031	HSJ2	heat shock protein, DNAJ-like 2	AA490946	
505	824031	HSJ2	heat shock protein, DNAJ-like 2	AA491132	
506	1606894	HSF4	heat shock transcription factor 4	AA999776	Hs.75486
507	562101	HERC1	hect (homologous to the E6-AP (UBE3A) carboxyl terminus) domain and RCC1 (CHC1)-like domain (RLD) 1	AA211496	Hs.255561
508	562101	HERC1	hect (homologous to the E6-AP (UBE3A) carboxyl terminus) domain and RCC1 (CHC1)-like domain (RLD) 1	AA211544	Hs.255561
509	85259	HMOX1	heme oxygenase (decycling) 1	T71757	Hs.202833
510	85259	HMOX1	heme oxygenase (decycling) 1	T71606	Hs.202833
511	745116	HMOX2	Heme oxygenase (decycling) 2	AA626370	Hs.83853
512	433307	HNF6A	hepatocyte nuclear factor 6, alpha	AA699732	Hs.73168
513	840158	HK1	Hexokinase 1	AA485271	Hs.118625
514	840158	HK1	Hexokinase 1	AA485272	Hs.118625
515	1338040	C46157	HEXOKINASE D, LIVER ISOZYMES	AA811712	
516	211780	No Data	Hexosaminidase B (beta polypeptide)	H71868	

517	211780	No Data	Hexosaminidase B (beta polypeptide)	H71081	
518	767441	HEXB	hexosaminidase B (beta polypeptide)	AA417946	Hs.51043
519	767441	HEXB	hexosaminidase B (beta polypeptide)	AA418121	Hs.51043
520	970591	HMG1	High-mobility group (nonhistone chromosomal) protein 1	AA683085	Hs.189509
521	363103	HMG2	High-mobility group (nonhistone chromosomal) protein 2	AA019511	Hs.80684
522	363103	HMG2	High-mobility group (nonhistone chromosomal) protein 2	AA019203	Hs.80684
523	80924	HO3	histidyl-tRNA synthetase	T70104	Hs.77798
524	80924	HO3	histidyl-tRNA synthetase	T70037	Hs.77798
525	812246	HLCS	holocarboxylase synthetase (biotin-[propionyl-Coenzyme A-carboxylase (ATP-hydrolysing)] ligase)	AA455043	Hs.79375
526	712577	HCCS	HOLOCYTOCHROME C-TYPE SYNTHETASE	AA281548	Hs.88859
527	712577	HCCS	HOLOCYTOCHROME C-TYPE SYNTHETASE	AA281549	Hs.88859
528	611075	HOXA1	homeo box A1	AA173231	
529	611075	HOXA1	homeo box A1	AA173290	
530	244146	APAF1	Homo sapiens apoptotic protease activating factor 1 (Apaf-1) mRNA, complete cds	N51014	Hs.77579
531	244146	APAF1	Homo sapiens apoptotic protease activating factor 1 (Apaf-1) mRNA, complete cds	N72045	Hs.77579
532	288796	BNIP2	Homo sapiens BCL2/adenovirus E1B 19kD-interacting protein 2 (BNIP2) mRNA, complete cds	N62514	Hs.155596
533	432620	NOD1	Homo sapiens caspase recruitment domain 4 (NOD1) mRNA	AA699441	
534	853506	23956 Mrna	Homo sapiens clone 23956 mRNA, partial cds	AA663549	Hs.8128
535	288888	EST	Homo sapiens clone 640 unknown mRNA, complete sequence	N62617	Hs.44563
536	288888	EST	Homo sapiens clone 640 unknown mRNA, complete sequence	N78388	Hs.44563
537	271102	CCS	Homo sapiens copper chaperone for superoxide dismutase (CCS) mRNA, complete cds	N30404	Hs.5002
538	489823	COX17	Homo sapiens COX17 mRNA, complete cds	AA099855	Hs.16297
539	489823	COX17	Homo sapiens COX17 mRNA, complete cds	AA099320	Hs.16297
540	487348	DYMPLE	Homo sapiens dynamin-like protein mRNA, complete cds	AA045529	Hs.180628
541	487348	DYMPLE	Homo sapiens dynamin-like protein mRNA, complete cds	AA040651	Hs.180628
542	359982	BNIP3	Homo sapiens E1B 19K/Bcl-2-binding protein Nip3 mRNA, nuclear gene encoding mitochondrial protein, complete cds	AA063521	Hs.79428

543	359982	BNIP3	Homo sapiens E1B 19K/Bcl-2-binding protein Nip3 mRNA, nuclear gene encoding mitochondrial protein, complete cds	AA035669	Hs.79428
544	395436	HUEL	Homo sapiens embryonic lung protein (HUEL) mRNA, complete cds	AA757427	Hs.44053
545	1472184	HUEL	Homo sapiens embryonic lung protein (HUEL) mRNA, complete cds	AA873264	Hs.44053
546	129644	SSH3BP1	Homo sapiens eps8 binding protein e3B1 mRNA, complete cds	R16667	Hs.24752
547	129644	SSH3BP1	Homo sapiens eps8 binding protein e3B1 mRNA, complete cds	R16666	Hs.24752
548	563574	FRG1	Homo sapiens FRG1 mRNA, complete cds	AA113339	Hs.203772
549	563574	FRG1	Homo sapiens FRG1 mRNA, complete cds	AA112636	Hs.203772
550	83279	TIM23	Homo sapiens inner mitochondrial membrane translocase Tim23 (TIM23) mRNA, nuclear gene encoding mitochondrial protein, complete cds	T68317	Hs.11866
551	83279	TIM23	Homo sapiens inner mitochondrial membrane translocase Tim23 (TIM23) mRNA, nuclear gene encoding mitochondrial protein, complete cds	T68386	Hs.11866
552	455123	KIAA0429	Homo sapiens KIAA0430 mRNA, complete cds	AA676805	Hs.77694
553	300590	APACD	Homo sapiens mRNA for ATP binding protein, complete cds	N80741	Hs.153884
554	300590	APACD	Homo sapiens mRNA for ATP binding protein, complete cds	W07537	Hs.153884
555	129146	COX7RP	Homo sapiens mRNA for COX7RP, complete cds	R10896	Hs.30888
556	129146	COX7RP	Homo sapiens mRNA for COX7RP, complete cds	R10947	Hs.30888
557	745314	HIRIP5	Homo sapiens mRNA for HIRA-interacting protein HIRIP5	AA625581	Hs.17368
558	810316	KIAA0631	Homo sapiens mRNA for KIAA0631 protein, partial cds	AA464206	Hs.75154
559	810316	KIAA0631	Homo sapiens mRNA for KIAA0631 protein, partial cds	AA464139	Hs.75154
560	490778	QP-C	Homo sapiens mRNA for low molecular mass ubiquinone-binding protein, complete cds	AA133191	Hs.3709
561	131653	RPMS12	Homo sapiens mRNA for mitochondrial ribosomal protein S12	R23752	Hs.9964
562	131653	RPMS12	Homo sapiens mRNA for mitochondrial ribosomal protein S12	R23806	Hs.9964
563	344825	LAS	Homo sapiens mRNA for putative lipoic acid synthetase, partial	W72965	Hs.53531
564	344825	LAS	Homo sapiens mRNA for putative lipoic acid synthetase, partial	W76202	Hs.53531
565	345621	CXX1	Homo sapiens mRNA for putatively prenylated protein	W72596	Hs.255532

566	345621	CXX1	Homo sapiens mRNA for putatively prenylated protein	W76590	Hs.255532
567	450574	SCA7	Homo Sapiens mRNA for spinocerebellar ataxia 7	AA704255	Hs.108447
568	123474	SCD	Homo sapiens mRNA for stearoyl-CoA desaturase	R00707	Hs.119597
569	123474	SCD	Homo sapiens mRNA for stearoyl-CoA desaturase	R00706	Hs.119597
570	855890	cDNA	Homo sapiens mRNA; cDNA DKFZp586C0722 (from clone DKFZp586C0722)	AA630320	Hs.255914
571	770043	NDUFV1	Homo sapiens NADH:ubiquinone dehydrogenase 51 kDa subunit (NDUFV1) mRNA, nuclear gene encoding mitochondrial protein, complete cds	AA427570	Hs.7744
572	770043	NDUFV1	Homo sapiens NADH:ubiquinone dehydrogenase 51 kDa subunit (NDUFV1) mRNA, nuclear gene encoding mitochondrial protein, complete cds	AA427652	Hs.7744
573	859228	IDH1	Homo sapiens NADP-dependent isocitrate dehydrogenase (IDH) mRNA, complete cds	AA666366	Hs.11223
574	124753	ABCD4	Homo sapiens peroxisomal membrane protein 69 (PMP69) mRNA, complete cds	R02189	Hs.94395
575	293104	PHYH	Homo sapiens peroxisomal phytanoyl-CoA alpha-hydroxylase (PAHX) mRNA, complete cds	N91990	Hs.172887
576	293104	PHYH	Homo sapiens peroxisomal phytanoyl-CoA alpha-hydroxylase (PAHX) mRNA, complete cds	N63845	Hs.172887
577	1629264	hTIM44	Homo sapiens putative mitochondrial inner membrane protein import receptor (hTIM44) mRNA, nuclear gene encoding mitochondrial protein, complete cds	AI003393	Hs.123178
578	399532	RPA40	Homo sapiens RNA polymerase I subunit hRPA39 mRNA, complete cds	AA733038	Hs.5409
579	787938	SLC4A4	Homo sapiens sodium bicarbonate cotransporter (HNBC1) mRNA, complete cds	AA452278	Hs.5462
580	138189	WFS1	Homo sapiens transmembrane protein (WFS1) mRNA, complete cds	R53910	Hs.26077
581	138189	WFS1	Homo sapiens transmembrane protein (WFS1) mRNA, complete cds	R53911	Hs.26077
582	266106	YWHAE	Human 14-3-3 epsilon mRNA, complete cds	N21624	Hs.79474
583	266106	YWHAE	Human 14-3-3 epsilon mRNA, complete cds	N28863	Hs.79474
584	45464	AK2	Human adenylate kinase 2 (adk2) mRNA, complete cds	H09730	Hs.171811
585	45464	AK2	Human adenylate kinase 2 (adk2) mRNA, complete cds	H10488	Hs.171811
586	795543	AOE372	Human antioxidant enzyme AOE37-2 mRNA, complete cds	AA459663	Hs.83383

587	241481	CASP10	Human apoptotic cysteine protease Mch4 (Mch4) mRNA, complete cds	H80712	Hs.5353
588	241481	CASP10	Human apoptotic cysteine protease Mch4 (Mch4) mRNA, complete cds	H80711	Hs.5353
589	897774	APRT	Human APRT gene for adenine phosphoribosyltransferase	AA598510	Hs.28914
590	810552	REA	Human B-cell receptor associated protein (hBAP) mRNA, partial cds	AA464669	Hs.7771
591	810552	REA	Human B-cell receptor associated protein (hBAP) mRNA, partial cds	AA464567	Hs.7771
592	2326129	BBC3	Human Bcl-2 binding component 3 (bbc3) mRNA, partial cds	AI688112	Hs.87246
593	795729	BAD	Human Bcl-2 binding component 6 (bbc6) mRNA, complete cds	AA460291	Hs.76366
594	795729	BAD	Human Bcl-2 binding component 6 (bbc6) mRNA, complete cds	AA461579	Hs.76366
595	814478	BCL2A1	Human Bcl-2 related (Bfl-1) mRNA, complete cds	AA459263	Hs.227817
596	814478	BCL2A1	Human Bcl-2 related (Bfl-1) mRNA, complete cds	AA459491	Hs.227817
597	212198	TP53BP2	Human Bcl2, p53 binding protein Bbp/53BP2 (BBP/53BP2) mRNA, complete cds	H69153	Hs.44585
598	212198	TP53BP2	Human Bcl2, p53 binding protein Bbp/53BP2 (BBP/53BP2) mRNA, complete cds	H69077	Hs.44585
599	432581	Novel Gene	Human BRCA2 region, mRNA sequence CG012	AA699390	Hs.184938
600	433111	BAC clone CIT987SK-A-735G6	Human Chromosome 16 BAC clone CIT987SK-A-735G6	AA680407	Hs.47278
601	782635	NDUFAB1	Human Chromosome 16 BAC clone CIT987SK-A-735G6	AA447569	Hs.5556
602	782635	NDUFAB1	Human Chromosome 16 BAC clone CIT987SK-A-735G6	AA448553	Hs.5556
603	669471	23589 mRNA	Human clone 23589 mRNA sequence	AA234889	Hs.11506
604	669471	23589 mRNA	Human clone 23589 mRNA sequence	AA253479	Hs.11506
605	771173	23732 mRNA	Human clone 23732 mRNA, partial cds	AA443497	Hs.81281
606	771173	23732 mRNA	Human clone 23732 mRNA, partial cds	AA429483	Hs.81281
607	745606	23759 mRNA	Human clone 23759 mRNA, partial cds	AA626336	Hs.118666
608	323500	CASP6	Human cysteine protease Mch2 isoform alpha (Mch2) mRNA, complete cds	W45688	Hs.3280
609	323500	CASP6	Human cysteine protease Mch2 isoform alpha (Mch2) mRNA, complete cds	W44316	Hs.3280
610	71420	CYP2C9	Human cytochrome P4502C9 (CYP2C9) mRNA, clone 65	T47787	
611	71420	CYP2C9	Human cytochrome P4502C9 (CYP2C9) mRNA, clone 65	T47788	
612	754490	SLC25A16	Human GT mitochondrial solute carrier protein homologue mRNA, complete cds	AA411554	Hs.180408
613	754490	SLC25A16	Human GT mitochondrial solute carrier protein homologue mRNA, complete cds	AA410572	Hs.180408

614	1734348	Go-alpha	Human guanine nucleotide-binding regulatory protein (Go-alpha) gene	AI188097	Hs.169647
615	826204	FLII	Human homolog of D. melanogaster flightless-I gene product mRNA, partial cds	AA521453	Hs.83849
616	144777	HAX1	Human HS1 binding protein HAX-1 mRNA, nuclear gene encoding mitochondrial protein, complete cds	R76263	Hs.15318
617	144777	HAX1	Human HS1 binding protein HAX-1 mRNA, nuclear gene encoding mitochondrial protein, complete cds	R76544	Hs.15318
618	261481	CUL3	Human Hs-cul-3 mRNA, partial cds	H98621	Hs.78946
619	261481	CUL3	Human Hs-cul-3 mRNA, partial cds	N25142	Hs.78946
620	233581	HIP2	Human huntingtin interacting protein (HIP2) mRNA, complete cds	H78483	Hs.155485
621	233581	HIP2	Human huntingtin interacting protein (HIP2) mRNA, complete cds	H78385	Hs.155485
622	363086	CKMT1	Human mitochondrial creatine kinase (CKMT) gene, complete cds	AA019482	Hs.153998
623	363086	CKMT1	Human mitochondrial creatine kinase (CKMT) gene, complete cds	AA019332	Hs.153998
624	1390584	MIPEP	Human mitochondrial intermediate peptidase precursor (MIPEP) mRNA, mitochondrial gene encoding mitochondrial protein, complete cds	AA843592	Hs.68583
625	134269	POLRMT	Human mitochondrial RNA polymerase mRNA, nuclear gene encoding mitochondrial protein, complete cds	R31115	Hs.153880
626	134269	POLRMT	Human mitochondrial RNA polymerase mRNA, nuclear gene encoding mitochondrial protein, complete cds	R31174	Hs.153880
627	781050	PFDN5	Human mRNA for c-myc binding protein, complete cds	AA446453	Hs.80686
628	781050	PFDN5	Human mRNA for c-myc binding protein, complete cds	AA430010	Hs.80686
629	451706	POLA	Human mRNA for DNA polymerase alpha-subunit	AA707650	Hs.74090
630	41541	EST	Human mRNA for KIAA0017 gene, complete cds	R52789	Hs.253023
631	41541	EST	Human mRNA for KIAA0017 gene, complete cds	R52788	Hs.253023
632	842818	KARS	Human mRNA for KIAA0070 gene, partial cds	AA486374	Hs.3100
633	842818	KARS	Human mRNA for KIAA0070 gene, partial cds	AA486220	Hs.3100
634	280496	KIAA0123	Human mRNA for KIAA0123 gene, partial cds	N51632	Hs.75353
635	859627	KIAA0185	Human mRNA for KIAA0185 gene, partial cds	AA666405	Hs.255573
636	783698	KIAA0188	Human mRNA for KIAA0188 gene, partial cds	AA446822	Hs.81412
637	783698	KIAA0188	Human mRNA for KIAA0188 gene, partial cds	AA446821	Hs.81412

638	347031	KIAA0195	Human mRNA for KIAA0195 gene, complete cds	W79511	Hs.80540
639	347031	KIAA0195	Human mRNA for KIAA0195 gene, complete cds	W79398	Hs.80540
640	753248	KIAA0381	Human mRNA for KIAA0381 gene, partial cds	AA406231	Hs.100113
641	753248	KIAA0381	Human mRNA for KIAA0381 gene, partial cds	AA406503	Hs.100113
642	108208	HADHB	Human mRNA for mitochondrial 3-ketoacyl-CoA thiolase beta-subunit of trifunctional protein, complete cds	T69767	Hs.146812
643	108208	HADHB	Human mRNA for mitochondrial 3-ketoacyl-CoA thiolase beta-subunit of trifunctional protein, complete cds	T70752	Hs.146812
644	869538	NDUFA4	Human NADH:ubiquinone oxidoreductase MLRQ subunit mRNA, complete cds	AA680322	Hs.108661
645	810452	TOM34	Human putative outer mitochondrial membrane 34 kDa translocase hTOM34 mRNA, complete cds	AA457118	Hs.76927
646	127197	CXORF6	Human Xq28 mRNA, complete cds	R08270	Hs.20136
647	127197	CXORF6	Human Xq28 mRNA, complete cds	R08271	Hs.20136
648	811108	TRIP6	Human zyxin related protein ZRP-1 mRNA, complete cds	AA485677	Hs.119498
649	811108	TRIP6	Human zyxin related protein ZRP-1 mRNA, complete cds	AA485807	Hs.119498
650	79828	HD	Huntingtin (Huntington disease)	T64094	Hs.79391
651	79828	HD	Huntingtin (Huntington disease)	T64015	Hs.79391
652	1752540	HIP1	huntingtin interacting protein 1	AI150389	
653	1566230	HYAL3	hyaluronoglucosaminidase 3	AI140794	Hs.129910
654	2095653	GLO4	HYDROXYACYLGLUTATHIONE HYDROLASE	AI420642	
655	141966	HSD3B1	hydroxy-delta-5-steroid dehydrogenase, 3 beta- and steroid delta-isomerase 1	R68803	Hs.38586
656	141966	HSD3B1	hydroxy-delta-5-steroid dehydrogenase, 3 beta- and steroid delta-isomerase 1	R68906	Hs.38586
657	126243	HMBS	Hydroxymethylbilane synthase	R06321	Hs.82609
658	126243	HMBS	Hydroxymethylbilane synthase	R06263	Hs.82609
659	321163	HSU79253	hypothetical protein	W53000	Hs.56155
660	321163	HSU79253	hypothetical protein	W52999	Hs.56155
661	280507	HPRT1	Hypoxanthine phosphoribosyltransferase 1 (Lesch-Nyhan syndrome)	N47312	Hs.82314
662	280507	HPRT1	Hypoxanthine phosphoribosyltransferase 1 (Lesch-Nyhan syndrome)	N47311	Hs.82314
663	2216141	IFM1	IFM1	AI654459	
664	767034	ILVBL	ilvB (bacterial acetolactate synthase)-like	AA424288	Hs.78880
665	767034	ILVBL	ilvB (bacterial acetolactate synthase)-like	AA451741	Hs.78880
666	1606837	IMPDH2	IMP (inosine monophosphate) dehydrogenase 2	AA996028	Hs.75432
667	50754	MTIF2	INITIATION FACTOR IF-2, MITOCHONDRIAL PRECURSOR	H18070	Hs.149894
668	111981	G1P3	interferon, alpha-inducible protein (clone IFI-6-16)	T84633	Hs.179972

669	111981	G1P3	interferon, alpha-inducible protein (clone IFI-6-16)	T91807	Hs.179972
670	491763	IL1B	Interleukin 1, beta	AA150507	Hs.126256
671	491763	IL1B	Interleukin 1, beta	AA156711	Hs.126256
672	2119594	IDH1	ISOCITRATE DEHYDROGENASE	AI399657	
673	869375	IDH2	Isocitrate dehydrogenase 2 (NADP+), mitochondrial	AA679907	Hs.252546
674	2168168	ETFB	isocitrate dehydrogenase 3 (NAD+) alpha (IDH3A),	AI565774	
675	755474	IARS	isoleucine-tRNA synthetase	AA410636	
676	755474	IARS	isoleucine-tRNA synthetase	AA419192	
677	810325	IVD	isovaleryl Coenzyme A dehydrogenase	AA464149	Hs.77510
678	810325	IVD	isovaleryl Coenzyme A dehydrogenase	AA464216	Hs.77510
679	2148505	JC4913	JC4913	AI469831	
680	809707	JUNB	jun B proto-oncogene	AA454711	Hs.198951
681	809707	JUNB	jun B proto-oncogene	AA456366	Hs.198951
682	1474284	KAI1	kangai 1 (suppression of tumorigenicity 6, prostate; CD82 antigen (R2 leukocyte antigen, antigen detected by monoclonal and antibody IA4))	AA922309	Hs.25409
683	845441	KIAA0016	KIAA0016 gene product	AA644550	Hs.75187
684	2241563	KIHUA3	KIHUA3	AI632351	
685	21738	HADHSC	L-3-hydroxyacyl-Coenzyme A dehydrogenase, short chain	T65482	Hs.7153
686	21738	HADHSC	L-3-hydroxyacyl-Coenzyme A dehydrogenase, short chain	T65407	Hs.7153
687	884644	LAMR1	Laminin receptor (2H5 epitope)	AA629897	Hs.181357
688	704360	LCFA HUMAN	LCFA HUMAN	AA279565	
689	1256792	MAD4	Mad4 homolog	AA875977	Hs.102402
690	1908746	MDH1	MALATE DEHYDROGENASE	AI302237	
691	1636908	MDH2	malate dehydrogenase 2, NAD (mitochondrial)	AI000271	Hs.111076
692	2010949	ME2	malic enzyme 2, mitochondrial	AI361039	Hs.75342
693	896921	ME3	malic enzyme, NADP+-dependent, mitochondrial	AA779401	Hs.2838
694	814211	M6PR	Mannose-6-phosphate receptor (cation dependent)	AA465223	Hs.75709
695	814211	M6PR	Mannose-6-phosphate receptor (cation dependent)	AA465578	Hs.75709
696	589115	MMP1	matrix metalloproteinase 1 (interstitial collagenase)	AA143201	
697	589115	MMP1	matrix metalloproteinase 1 (interstitial collagenase)	AA143331	
698	1574438	MMP11	matrix metalloproteinase 11 (stromelysin 3)	AA954935	Hs.155324
699	196612	MMP12	matrix metalloproteinase 12 (macrophage elastase)	R92994	Hs.1695
700	196612	MMP12	matrix metalloproteinase 12 (macrophage elastase)	R93037	Hs.1695
701	251047	MMP17	matrix metalloproteinase 17 (membrane-inserted)	H97792	Hs.159581
702	784589	MMP15	Matrix metalloproteinase 2	AA443300	Hs.80343
703	784589	MMP15	Matrix metalloproteinase 2	AA443433	Hs.80343

704	470393	MMP7	matrix metalloproteinase 7 (matrilysin, uterine)	AA031513	Hs.2256
705	470393	MMP7	matrix metalloproteinase 7 (matrilysin, uterine)	AA031514	Hs.2256
706	2213770	CCHU	Matrix metalloproteinase 7 (matrilysin, uterine)	AI582304	
707	22040	MMP9	matrix metalloproteinase 9 (gelatinase B, 92kD gelatinase, 92kD type IV collagenase)	T72581	
708	22040	MMP9	matrix metalloproteinase 9 (gelatinase B, 92kD gelatinase, 92kD type IV collagenase)	T64837	
709	773266	MMP9	matrix metalloproteinase 9 (gelatinase B, 92kD gelatinase, 92kD type IV collagenase)	AA425227	Hs.151738
710	773266	MMP9	matrix metalloproteinase 9 (gelatinase B, 92kD gelatinase, 92kD type IV collagenase)	AA425503	Hs.151738
711	2091860	MMPL1	matrix metalloproteinase-like 1	AI382081	Hs.198265
712	240766	Data unavailable	METALLOPROTEINASE INHIBITOR 1 PRECURSOR	H80214	
713	240766	Data unavailable	METALLOPROTEINASE INHIBITOR 1 PRECURSOR	H80215	
714	2165301	DEHUMT	methylene tetrahydrofolate dehydrogenase (NAD ⁺ dependent), methenyltetrahydrofolate cyclohydrolase	AI497794	
715	1473506	MMSA_HUMAN	METHYLMALONATE-SEMIALDEHYDE DEHYDROGENASE	AA915881	
716	2091562	S40622	METHYLMALONYL-COA MUTASE PRECURSOR	AI377286	
717	278570	MITF	Microphthalmia-associated transcription factor	N66177	Hs.166017
718	278570	MITF	Microphthalmia-associated transcription factor	N99168	Hs.166017
719	768443	MGST1	microsomal glutathione S-transferase 1	AA495936	Hs.790
720	768443	MGST1	microsomal glutathione S-transferase 1	AA495935	Hs.790
721	629896	MAP1B	MICROTUBULE-ASSOCIATED PROTEIN 1B	AA219045	Hs.103042
722	1084029	A56650	MITOCHONDRIAL 2-OXOGLUTARATE/MALATE CARRIER PROTEIN	AA594052	
723	44255	RPML3	MITOCHONDRIAL 60S RIBOSOMAL PROTEIN L3	H06113	Hs.79086
724	44255	RPML3	MITOCHONDRIAL 60S RIBOSOMAL PROTEIN L3	H05820	Hs.79086
725	433553	CA5	Mitochondrial carbonic anhydrase	AA699469	Hs.177446
726	1175538	A39018	MITOCHONDRIAL CARNITINE PALMITOYLTRANSFERASE II PRECURSOR	AA641442	
727	324618	TSFM	MITOCHONDRIAL ELONGATION FACTOR TS PRECURSOR	W47015	Hs.3273
728	324618	TSFM	MITOCHONDRIAL ELONGATION FACTOR TS PRECURSOR	W47014	Hs.3273

729	2066585	LON-PEN	MITOCHONDRIAL LON PROTEASE HOMOLOG	AI377406	
730	133099	MMP1 Precursor	MITOCHONDRIAL MATRIX PROTEIN P1 PRECURSOR	R26234	
731	133099	MMP1 Precursor	MITOCHONDRIAL MATRIX PROTEIN P1 PRECURSOR	R26235	
732	448491	mrp2	MITOCHONDRIAL RIBOSOMAL PROTEIN S14	AA777627	
733	1587031	HSPA9	MITOCHONDRIAL STRESS-70 PROTEIN	AA948223	
734	814346	MTIF2	mitochondrial translational initiation factor 2	AA458825	Hs.149894
735	814346	MTIF2	mitochondrial translational initiation factor 2	AA459016	Hs.149894
736	1916771	MTRF1	mitochondrial translational release factor 1	AI347695	Hs.80683
737	1880757	MAP3K5	mitogen-activated protein kinase kinase kinase 5	AI268273	Hs.151988
738	2244621	MRF1	MRF1	AI656905	
739	645006	MRP4	MRP4	AA197284	
740	645006	MRP4	MRP4	AA205815	
741	1933324	MPZ	myelin protein zero (Charcot-Marie- Tooth neuropathy 1B)	AI351956	Hs.93883
742	302190	MLL	myeloid/lymphoid or mixed-lineage leukemia (trithorax (Drosophila) homolog)	W16724	Hs.199160
743	302190	MLL	myeloid/lymphoid or mixed-lineage leukemia (trithorax (Drosophila) homolog)	N77807	Hs.199160
744	842989	MYL6	MYOSIN LIGHT CHAIN ALKALI, NON-MUSCLE ISOFORM	AA488346	Hs.77385
745	842989	MYL6	MYOSIN LIGHT CHAIN ALKALI, NON-MUSCLE ISOFORM	AA488477	Hs.77385
746	814615	MTHFD2	NAD-dependent methylene tetrahydrofolate dehydrogenase cyclohydrolase	AA480995	Hs.154672
747	814615	MTHFD2	NAD-dependent methylene tetrahydrofolate dehydrogenase cyclohydrolase	AA480994	Hs.154672
748	773287	NDUFA2	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 2 (8kD, B8)	AA425211	Hs.163867
749	773287	NDUFA2	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 2 (8kD, B8)	AA425534	Hs.163867
750	1635681	NDUFA2	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 2 (8kD, B8)	AI017426	Hs.163867
751	950578	NDUFA5	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 5 (13kD, B13)	AA608515	Hs.83916
752	897987	NDUFA9	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 9 (39kD)	AA598884	Hs.75227
753	450896	NDUFB4	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 4 (15kD, B15)	AA704675	
754	562409	NDUFSS	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 4 (15kD, B15)	AA214053	Hs.80595

755	562409	NDUFS5	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 4 (15kD, B15)	AA214154	Hs.80595
756	307933	NDUFB5	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 5 (16kD, SGD)	N93053	Hs.19236
757	307933	NDUFB5	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 5 (16kD, SGD)	W21390	Hs.19236
758	470861	NDUFB6	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 6 (17kD, B17)	AA034268	Hs.109646
759	470861	NDUFB6	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 6 (17kD, B17)	AA032077	Hs.109646
760	771089	NDUFB7	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 7 (18kD, B18)	AA428058	Hs.661
761	771089	NDUFB7	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 7 (18kD, B18)	AA429046	Hs.661
762	796513	NDUFC1	NADH dehydrogenase (ubiquinone) 1, subcomplex unknown, 1 (6kD, KFYI)	AA460251	Hs.84549
763	796513	NDUFC1	NADH dehydrogenase (ubiquinone) 1, subcomplex unknown, 1 (6kD, KFYI)	AA463815	Hs.84549
764	753457	NDUFS1	NADH dehydrogenase (ubiquinone) Fe-S protein 1 (75kD) (NADH-coenzyme Q reductase)	AA406535	Hs.8248
765	753457	NDUFS1	NADH dehydrogenase (ubiquinone) Fe-S protein 1 (75kD) (NADH-coenzyme Q reductase)	AA406536	Hs.8248
766	743811	NDUFS3	NADH dehydrogenase (ubiquinone) Fe-S protein 3 (30kD) (NADH-coenzyme Q reductase)	AA634381	Hs.5273
767	377152	NDUFS4	NADH dehydrogenase (ubiquinone) Fe-S protein 4 (18kD) (NADH-coenzyme Q reductase)	AA055101	Hs.10758
768	377152	NDUFS4	NADH dehydrogenase (ubiquinone) Fe-S protein 4 (18kD) (NADH-coenzyme Q reductase)	AA055102	Hs.10758
769	502141	NDUFS8	NADH dehydrogenase (ubiquinone) Fe-S protein 8 (23kD) (NADH-coenzyme Q reductase)	AA127014	Hs.90443
770	502141	NDUFS8	NADH dehydrogenase (ubiquinone) Fe-S protein 8 (23kD) (NADH-coenzyme Q reductase)	AA128218	Hs.90443
771	1486260	NDUFV2	NADH dehydrogenase (ubiquinone) flavoprotein 2 (24kD)	AA922326	Hs.51299
772	1676983	RDHUB5	NADH-CYTOCHROME B5 REDUCTASE	AI076798	
773	1632011	NPR2	natriuretic peptide receptor B/guanylate cyclase B (atrionatriuretic peptide receptor B)	AA994689	Hs.78518
774	994950	NDUFA10	NDUFA10	AA555087	
775	1588691	NDUFA2	NDUFA2	AA975360	
776	929358	NDUFA3	NDUFA3	AA492039	
777	2118546	NDUFA6	NDUFA6	AI524304	
778	1270489	NDUFA7	NDUFA7	AA748476	
779	171756	NDUFA8	NDUFA8	HI8333	

780	171756	NDUFA8	NDUFA8	H18364	
781	1473135	NDUFAB1	NDUFAB1	AA873566	
782	998616	NDUFB1	NDUFB1	AA535762	
783	2170527	NDUFB10	NDUFB10	AI571333	
784	1881693	NDUFB2	NDUFB2	AI290799	
785	2103675	NDUFB3	NDUFB3	AI401200	
786	2266937	NDUFB8	NDUFB8	AI608733	
787	984496	NDUFB9	NDUFB9	AA526075	
788	2277817	NDUFC2	NDUFC2	AI653801	
789	1019401	NDUFS2	NDUFS2	AA551149	
790	1585499	NDUFS5	NDUFS5	AA974058	
791	51826	NNT	nicotinamide nucleotide transhydrogenase	H22944	Hs.18136
792	51826	NNT	nicotinamide nucleotide transhydrogenase	H24126	Hs.18136
793	1160732	NOS2A	Nitric oxide synthase 2A (inducible, hepatocytes)	AA877840	Hs.193788
794	150466	EST	Nitric oxide synthase 3 (endothelial cell)	H01039	Hs.237163
795	150466	EST	Nitric oxide synthase 3 (endothelial cell)	H01788	Hs.237163
796	1468820	NOS3	nitric oxide synthase 3 (endothelial cell)	AA884967	Hs.166373
797	755750	NME2	non-metastatic cells 2, protein (NM23B) expressed in	AA496628	Hs.255790
798	755750	NME2	non-metastatic cells 2, protein (NM23B) expressed in	AA496512	Hs.255790
799	207808	NFATC3	nuclear factor of activated T-cells, cytoplasmic 3	H59048	Hs.172674
800	207808	NFATC3	nuclear factor of activated T-cells, cytoplasmic 3	H59047	Hs.172674
801	1870662	A54868	nuclear respiratory factor 1 (NRF1)	AI245773	
802	567414	NFYB	nuclear transcription factor Y, beta	AA130846	
803	783696	OAT	ornithine aminotransferase (gyrate atrophy)	AA446819	Hs.75485
804	783696	OAT	ornithine aminotransferase (gyrate atrophy)	AA446820	Hs.75485
805	796646	ODC1	Ornithine decarboxylase 1	AA460115	Hs.75212
806	796646	ODC1	Ornithine decarboxylase 1	AA461467	Hs.75212
807	1637751	OXA1L	oxidase (cytochrome c) assembly 1-like	AI001180	Hs.151134
808	1704170	OXA1HS	oxoglutarate dehydrogenase (lipoamide)	AI096611	
809	233479	No Data	Oxoglutarate dehydrogenase (lipoamide)	H78910	
810	233479	No Data	Oxoglutarate dehydrogenase (lipoamide)	H80138	
811	1371793	OGDH	oxoglutarate dehydrogenase (lipoamide)	AA856769	Hs.168669
812	1632231	UQCRC1	P31930 UBIQUINOL-CYTOCHROME-C REDUCTASE COMPLEX CORE PROTEIN I PRECURSOR	AI005342	
813	162775	DDX5	P68 PROTEIN	H27564	Hs.76053
814	162775	DDX5	P68 PROTEIN	H27646	Hs.76053
815	43884	PPIF	PEPTIDYL-PROLYL CIS-TRANS ISOMERASE, MITOCHONDRIAL PRECURSOR	H05580	Hs.173125
816	43884	PPIF	PEPTIDYL-PROLYL CIS-TRANS ISOMERASE, MITOCHONDRIAL PRECURSOR	H05115	Hs.173125
817	774726	PPIF	peptidylprolyl isomerase F (cyclophilin F)	AA442081	Hs.173125
818	774726	PPIF	peptidylprolyl isomerase F (cyclophilin F)	AA442184	Hs.173125

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819	133273	PMP22	peripheral myelin protein 22	R26960	Hs.103724
820	133273	PMP22	peripheral myelin protein 22	R26732	Hs.103724
821	788518	PXMP3	Peroxisomal membrane protein 3 (35kD, Zellweger syndrome)	AA452566	
822	788518	PXMP3	Peroxisomal membrane protein 3 (35kD, Zellweger syndrome)	AA452747	
823	1476157	PXR1	peroxisome receptor 1	AA873073	Hs.158084
824	455263	PET112L	PET112 (yeast homolog)-like	AA677572	Hs.11127
825	951683	PHC	PHC	AA629980	
826	843109	FARS1	phenylalanine-tRNA synthetase	AA488691	Hs.57969
827	843109	FARS1	phenylalanine-tRNA synthetase	AA486503	Hs.57969
828	842784	PHC	phosphate carrier, mitochondrial	AA486305	Hs.78713
829	842784	PHC	phosphate carrier, mitochondrial	AA486200	Hs.78713
830	346009	PFKL	Phosphofructokinase (liver type)	W72140	Hs.155455
831	346009	PFKL	Phosphofructokinase (liver type)	W77881	Hs.155455
832	489626	PFKM	Phosphofructokinase, muscle	AA099169	Hs.75160
833	489626	PFKM	Phosphofructokinase, muscle	AA101919	Hs.75160
834	183194		phospholipase A2, group IIA (platelets, synovial fluid)	H44953	
835	183194		phospholipase A2, group IIA (platelets, synovial fluid)	H45000	
836	77915	PLA2G2A	phospholipase A2, group IIA (platelets, synovial fluid)	T61323	Hs.76422
837	77915	PLA2G2A	phospholipase A2, group IIA (platelets, synovial fluid)	T61271	Hs.76422
838	2367279	PN0673	PN0673	AI741984	
839	780947	POLD1	Polymerase (DNA directed), delta 1, catalytic subunit (125kD)	AA429661	Hs.99890
840	780947	POLD1	Polymerase (DNA directed), delta 1, catalytic subunit (125kD)	AA446151	Hs.99890
841	626206	POLG	polymerase (DNA directed), gamma	AA188761	Hs.80961
842	626206	POLG	polymerase (DNA directed), gamma	AA188629	Hs.80961
843	827129	POLRMT	polymerase (RNA) mitochondrial (DNA directed)	AA521239	Hs.153880
844	2144562	PRAX-1	PRAX-1	AI452994	
845	826211	PDCD2	Programmed cell death 2	AA521466	Hs.41639
846	814337	PCCB	propionyl Coenzyme A carboxylase, beta polypeptide	AA459122	Hs.63788
847	814337	PCCB	propionyl Coenzyme A carboxylase, beta polypeptide	AA459341	Hs.63788
848	950710	PCCA	Propionyl-coA carboxylase alpha chain	AA608575	Hs.80741
849	824568	KLK3	Prostate specific antigen	AA490981	Hs.171995
850	843134	PBP	Prostatic binding protein	AA486514	Hs.80423
851	843134	PBP	Prostatic binding protein	AA485909	Hs.80423
852	261971	PRSM1	protease, metallo, 1, 33kD	N27227	Hs.183138
853	261971	PRSM1	protease, metallo, 1, 33kD	H98666	Hs.183138
854	375728	PRSM1	protease, metallo, 1, 33kD	AA033807	Hs.183138
855	51041	Est	protoporphyrinogen oxidase	H18633	Hs.123641
856	51041	Est	protoporphyrinogen oxidase	H18716	Hs.123641
857	247160	PPOX	protoporphyrinogen oxidase	N57891	Hs.100016
858	504452	PPOX	protoporphyrinogen oxidase	AA151249	Hs.100016
859	504452	PPOX	protoporphyrinogen oxidase	AA151248	Hs.100016

860	501939	HHCMA56	putative oxidoreductase	AA128041	Hs.519
861	501939	HHCMA56	putative oxidoreductase	AA128086	Hs.519
862	108378	PC	pyruvate carboxylase	T77729	Hs.89890
863	108378	PC	pyruvate carboxylase	T77728	Hs.89890
864	80374	PDHA1	Pyruvate dehydrogenase (lipoamide) alpha 1	T65833	Hs.1023
865	80374	PDHA1	Pyruvate dehydrogenase (lipoamide) alpha 1	T65758	Hs.1023
866	826077	PDHB	pyruvate dehydrogenase (lipoamide) beta	AA521401	Hs.979
867	279665	PDX1	Pyruvate dehydrogenase complex, lipoyl-containing component X; E3-binding protein	N48320	Hs.74642
868	279665	PDX1	Pyruvate dehydrogenase complex, lipoyl-containing component X; E3-binding protein	N49046	Hs.74642
869	1542260	PDHA2	PYRUVATE DEHYDROGENASE E1 COMPONENT, ALPHA	AA927400	
870	1645668	PDK1	pyruvate dehydrogenase kinase, isoenzyme 1	AI026814	Hs.159477
871	66686	No Data	QM PROTEIN	T67270	
872	66686	No Data	QM PROTEIN	T67271	
873	590727	RENT1	regulator of nonsense transcripts 1	AA156342	Hs.12719
874	590727	RENT1	regulator of nonsense transcripts 1	AA156376	Hs.12719
875	624627	RRM2	Ribonucleotide reductase M2 polypeptide	AA187351	Hs.75319
876	624627	RRM2	Ribonucleotide reductase M2 polypeptide	AA188430	Hs.75319
877	788334	RPL23L	ribosomal protein L23-like	AA453015	Hs.3254
878	730124	RPL7	Ribosomal protein L7	AA412470	Hs.153
879	730124	RPL7	Ribosomal protein L7	AA412344	Hs.153
880	809578	RPS5	Ribosomal protein S5	AA456616	Hs.76194
881	809578	RPS5	Ribosomal protein S5	AA455795	Hs.76194
882	214133	FSRG1	RING3 PROTEIN	H72520	Hs.75243
883	214133	FSRG1	RING3 PROTEIN	H72918	Hs.75243
884	110744	SCO2	SCO (cytochrome oxidase deficient, yeast) homolog 2	T90560	Hs.180903
885	110744	SCO2	SCO (cytochrome oxidase deficient, yeast) homolog 2	T83097	Hs.180903
886	646657	SCO1	SCO1 (yeast homolog) cytochrome oxidase deficient 1	AA205413	Hs.14511
887	646657	SCO1	SCO1 (yeast homolog) cytochrome oxidase deficient 1	AA205579	Hs.14511
888	1074487	SDHD	SDHD	AA579646	
889	951117	SHMT2	serine hydroxymethyltransferase 2 (mitochondrial)	AA620477	
890	2138479	XNHUSP	SERINE-PYRUVATE AMINOTRANSFERASE	AI521720	
891	125183	SSBP	single-stranded DNA-binding protein	R05693	Hs.923
892	125183	SSBP	single-stranded DNA-binding protein	R05694	Hs.923
893	813678	SLC1A3	solute carrier family 1 (glial high affinity glutamate transporter), member 3	AA453823	Hs.75379
894	813678	SLC1A3	solute carrier family 1 (glial high affinity glutamate transporter), member 3	AA453742	Hs.75379
895	586990	SLC11A2	solute carrier family 11 (proton-coupled divalent metal ion transporters), member	AA133656	Hs.57435

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896	586990	SLC11A2	solute carrier family 11 (proton-coupled divalent metal ion transporters), member 2	AA133655	Hs.57435
897	2029995	SLC12A7	solute carrier family 12 (potassium/chloride transporters), member 7	AI492956	Hs.172613
898	190732	SLC2A5	Solute carrier family 2 (facilitated glucose transporter), member 5	H38650	Hs.33084
899	190732	SLC2A5	Solute carrier family 2 (facilitated glucose transporter), member 5	H38733	Hs.33084
900	758304	SLC25A14	solute carrier family 25 (mitochondrial carrier, brain), member 14	AA404241	Hs.194686
901	758304	SLC25A14	solute carrier family 25 (mitochondrial carrier, brain), member 14	AA401224	Hs.194686
902	897107	SLC25A1	solute carrier family 25 (mitochondrial carrier; citrate transporter), member 1	AA676877	Hs.111024
903	878413	SLC25A11	solute carrier family 25 (mitochondrial carrier; oxoglutarate carrier), member 11	AA670357	Hs.184877
904	433350	SORD	Sorbitol dehydrogenase	AA700604	Hs.878
905	1256737	SPG7	spastic paraplegia 7, paraplegin (pure and complicated autosomal recessive)	AA876165	Hs.78497
906	682528	SCA1	spinocerebellar ataxia 1 (olivopontocerebellar ataxia 1, autosomal dominant, ataxin 1)	AA256507	Hs.74520
907	682528	SCA1	spinocerebellar ataxia 1 (olivopontocerebellar ataxia 1, autosomal dominant, ataxin 1)	AA256508	Hs.74520
908	128875	SCA2	Spinocerebellar ataxia 2 (olivopontocerebellar ataxia 2, autosomal dominant)	R10604	Hs.76253
909	128875	SCA2	Spinocerebellar ataxia 2 (olivopontocerebellar ataxia 2, autosomal dominant)	R10603	Hs.76253
910	447167	SFRS8	splicing factor, arginine/serine-rich 8 (suppressor-of-white-apricot, Drosophila homolog)	AA702973	Hs.84229
911	1934125	B34181	steroid 11-beta-hydroxylase	AI334352	
912	859858	STAR	steroidogenic acute regulatory protein	AA679454	Hs.3132
913	855395	SCP2	sterol carrier protein 2	AA664009	Hs.75760
914	824699	SUCA_HUMAN	SUCA_HUMAN	AA482206	
915	80915	SDHA	Succinate dehydrogenase 2, flavoprotein (Fp) subunit	T70043	
916	80915	SDHA	Succinate dehydrogenase 2, flavoprotein (Fp) subunit	T70109	
917	797016	SDHB	succinate dehydrogenase complex, subunit B, iron sulfur (Ip)	AA463565	Hs.64
918	797016	SDHB	succinate dehydrogenase complex, subunit B, iron sulfur (Ip)	AA463510	Hs.64
919	366132	SDHC	succinate dehydrogenase complex, subunit C, integral membrane protein, 15kD	AA062805	Hs.3577

920	504145	LSC2	SUCCINATE-COA LIGASE	AA132000	
921	504145	LSC2	SUCCINATE-COA LIGASE	AA131817	
922	845630	SUCLA2	succinate-CoA ligase, ADP-forming, beta subunit	AA644577	Hs.182217
923	1571111	SCOT_HUMAN	Succinyl CoA:3-oxoacid CoA transferase	AA936982	
924	950489	SOD1	Superoxide dismutase 1 (Cu/Zn)	AA599127	Hs.75428
925	1572467	SOD2	Superoxide dismutase 2	AA934677	
926	346860	SOD2	superoxide dismutase 2, mitochondrial	W78148	Hs.177781
927	346860	SOD2	superoxide dismutase 2, mitochondrial	W79913	Hs.177781
928	840708	SOD2	Superoxide dismutase 2, mitochondrial	AA488084	Hs.177781
929	840708	SOD2	Superoxide dismutase 2, mitochondrial	AA487750	Hs.177781
930	1343732	SOD3	Superoxide dismutase 3, extracellular	AA725564	Hs.2420
931	433474	SURF1	Surfeit 1	AA699560	Hs.3196
932	2114302	surfeit 1	surfeit 1	AI417847	Hs.3196
933	782797	SMN1	survival of motor neuron 1, telomeric	AA448194	Hs.77306
934	704299	TAZ	tafazzin (cardiomyopathy, dilated 3A (X-linked); endocardial fibroelastosis 2; Barth syndrome)	AA279440	Hs.79021
935	789376	TXNRD1	thioredoxin reductase 1	AA453335	Hs.13046
936	789376	TXNRD1	thioredoxin reductase 1	AA464849	Hs.13046
937	796000	MPST	thiosulfate sulfurtransferase (rhodanese)	AA461065	Hs.74097
938	796000	MPST	thiosulfate sulfurtransferase (rhodanese)	AA460495	Hs.74097
939	856167	TARS	threonyl-tRNA synthetase	AA630628	Hs.84131
940	205185	THBD	Thrombomodulin	H59861	Hs.2030
941	205185	THBD	Thrombomodulin	H60674	Hs.2030
942	246300	TIAL1	TIA1 cytotoxic granule-associated RNA-binding protein-like 1	N59426	Hs.182741
943	842846	TIMP2	tissue inhibitor of metalloproteinase 2	AA486280	Hs.246948
944	489519	TIMP3	tissue inhibitor of metalloproteinase 3 (Sorsby fundus dystrophy, pseudoinflammatory)	AA099153	Hs.245188
945	489519	TIMP3	tissue inhibitor of metalloproteinase 3 (Sorsby fundus dystrophy, pseudoinflammatory)	AA099251	Hs.245188
946	754106	TIMP3	tissue inhibitor of metalloproteinase 3 (Sorsby fundus dystrophy, pseudoinflammatory)	AA479202	Hs.245188
947	754106	TIMP3	tissue inhibitor of metalloproteinase 3 (Sorsby fundus dystrophy, pseudoinflammatory)	AA478662	Hs.245188
948	433481	TCF2	transcription factor 2, hepatic; LF-B3; variant hepatic nuclear factor	AA699573	Hs.169853
949	785845	TCF6L1	Transcription factor 6-like 1 (mitochondrial transcription factor 1-like)	AA449118	Hs.75133
950	785845	TCF6L1	Transcription factor 6-like 1 (mitochondrial transcription factor 1-like)	AA449551	Hs.75133
951	841334	STIP1	TRANSFORMATION-SENSITIVE PROTEIN IEF SSP 3521	AA487635	Hs.75612
952	841334	STIP1	TRANSFORMATION-SENSITIVE PROTEIN IEF SSP 3521	AA487427	Hs.75612
953	2114841	U66035	translocase of inner mitochondrial membrane 8	AI432207	
954	970880	TPM4	tropomyosin 4	AA774983	Hs.102824

955	341328	TPM1	Tropomyosin alpha chain (skeletal muscle)	W58092	Hs.77899
956	341328	TPM1	Tropomyosin alpha chain (skeletal muscle)	W58009	Hs.77899
957	32621	WARS2	tryptophanyl tRNA synthetase 2 (mitochondrial)	R43272	Hs.227274
958	32621	WARS2	tryptophanyl tRNA synthetase 2 (mitochondrial)	R18903	Hs.227274
959	684582	WARS2	tryptophanyl tRNA synthetase 2 (mitochondrial)	AA251354	Hs.227274
960	684582	WARS2	tryptophanyl tRNA synthetase 2 (mitochondrial)	AA251468	Hs.227274
961	594079	TID1	tumorous imaginal discs (Drosophila) homolog	AA169872	Hs.6216
962	594079	TID1	tumorous imaginal discs (Drosophila) homolog	AA169567	Hs.6216
963	1569989	YWHAB	tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, beta polypeptide	AA962407	Hs.182238
964	1591788	YWHAZ	tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, zeta polypeptide	AA976477	Hs.75103
965	25499	UQCRH	UBIQUINOL-CYTOCHROME C REDUCTASE COMPLEX 11 KD PROTEIN PRECURSOR	R11698	Hs.73818
966	25499	UQCRH	UBIQUINOL-CYTOCHROME C REDUCTASE COMPLEX 11 KD PROTEIN PRECURSOR	R17676	Hs.73818
967	855843	UQCRB	UBIQUINOL-CYTOCHROME C REDUCTASE COMPLEX 14 KD PROTEIN	AA664284	Hs.131255
968	1160934	UQCRC2	UBIQUINOL-CYTOCHROME C REDUCTASE CORE PROTEIN 2 PRECURSOR	AA877491	
969	782800	UQCRFS1	UBIQUINOL-CYTOCHROME C REDUCTASE IRON-SULFUR SUBUNIT PRECURSOR	AA448184	Hs.3712
970	1955460	MAS2	UCR1 HUMAN P31930 UBIQUINOL-CYTOCHROME-C REDUCTASE COMPLEX CORE PROTEIN I	AI365986	
971	236034	UCP2	uncoupling protein 2 (mitochondrial, proton carrier)	H61243	Hs.80658
972	236034	UCP2	uncoupling protein 2 (mitochondrial, proton carrier)	H61242	Hs.80658
973	628529	EST	uncoupling protein 3 (mitochondrial, proton carrier)	AA192553	Hs.76640
974	628529	EST	uncoupling protein 3 (mitochondrial, proton carrier)	AA192136	Hs.76640
975	197932	UQCRB	UQCRB	R96352	Hs.77385
976	197932	UQCRB	UQCRB	R96395	Hs.77385

977	49464	UNG	uracil-DNA glycosylase	H15111	Hs.78853
978	49464	UNG	uracil-DNA glycosylase	H15112	Hs.78853
979	760148	UROD	Uroporphyrinogen decarboxylase	AA424441	Hs.78601
980	760148	UROD	Uroporphyrinogen decarboxylase	AA424344	Hs.78601
981	34778	VEGF	vascular endothelial growth factor	R45059	
982	34778	VEGF	vascular endothelial growth factor	R19956	
983	1762200	VDAC1	VDAC1	AI205945	
984	1911533	VDAC3	VDAC3	AI268057	
985	486221	VDAC1	Voltage-dependent anion channel 1	AA044059	Hs.149155
986	486221	VDAC1	Voltage-dependent anion channel 1	AA044113	Hs.149155
987	1434908	VDAC2	Voltage-dependent anion channel 2	AA857093	Hs.78902
988	796759	VDAC3	voltage-dependent anion channel 3	AA460728	Hs.7381
989	796759	VDAC3	voltage-dependent anion channel 3	AA460900	Hs.7381
990	815683	WBSCR9	Williams-Beuren syndrome chromosome region 9	AA485132	Hs.194688
991	815683	WBSCR9	Williams-Beuren syndrome chromosome region 9	AA485131	Hs.194688
992	878676	XRCC5	X-ray repair complementing defective repair in Chinese hamster cells 5 (double-strand-break rejoining; Ku autoantigen, 80kD)	AA775355	Hs.84981
993	269381	ZNF148	zinc finger protein 148 (pHZ-52)	N26148	
994	745503	ZNF9	zinc finger protein 9 (a cellular retroviral nucleic acid binding protein)	AA625995	Hs.2110

Example 2

Mouse Mitochondrial Biology Array

A mouse mitochondrial biology array is made from clones representing expressed sequences. The clones placed on the array are shown in Table 4 which references sequence ID NOS:995-3040 provided herein setting forth the 5' and 3' sequences from these clones. See Tanaka, T.S. et al., (2000) "Genome-wide expression profiling of mid-gestation placenta and embryo using 15k mouse developmental cDNA microarray" *Proc. Natl. Acad. Sci. USA* 97:9127-9132. Equivalent clones useful as probes are listed in Table 5. The clones listed in Table 4 are preferable to the clones listed in Table 5. The clones identified in Table 4 are used to make a set of probes called Mouse Probe Set #2. The clones identified in Table 5 are used to make a set of probes called Mouse Probe Set #3. Control sequences are also placed this array. Controls include, but are not limited to blanks, DMSO, probes derived from plant sequences, sequence(s) not involved in mitochondrial biology, and poly adenine (40-60 nucleotides long). Sequences used to make probes for the mouse mitochondrial genes can also be found in GenBank Accession No. J01420, which provides the complete mouse mitochondrial genome. Preferably, the probes used for ATP8 and ATP6 do not cross-hybridize with each other.

Table 4

SEQ ID NO:	NIA Clone No.	Gene	Clone description	GenBank Accession No.	Unigene Cluster ID	Function
995	H3001A07	Mm.42805			Mm.42805	Energy/Metabolism
996						
997	H3001C04	major histocompatibility locus class III region: butyrophilin-like protein gene, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, palmitoyl-protein thioesterase	Mus musculus major histocompatibility locus class III region: butyrophilin-like protein gene, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, palmitoyl-protein thioesterase		Mm.7447	Transcription/Chromatin
998						
999	H3001F12	heparan sulfate (glucosamine) 3-O-sulfotransferase 1 (Hs3st1), mRNA	Mus musculus heparan sulfate (glucosamine) 3-O-sulfotransferase 1 (Hs3st1), mRNA	BG063066	Mm.100135	Energy/Metabolism
1000						
1001	H3001H04	Rat farnesyltransferase beta subunit	Rat farnesyltransferase beta subunit mRNA, complete cds	BG076556	Mm.28696	Energy/Metabolism
1002						
1003	H3001H05	CPN10-like protein (Cpn10-rs1) gene	Mus musculus CPN10-like protein (Cpn10-rs1) gene, complete cds	BG063078	Mm.12970	Heat Shock/Stress
1004						
1005	H3002A01	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 7 (18kD, B18) (NDUFB7), mRNA	Homo sapiens NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 7 (18kD, B18) (NDUFB7), mRNA	BG076562	Mm.29683	Energy/Metabolism
1006						
1007	H3002B09	cytochrome c gene (MC1)	Mouse cytochrome c gene (MC1)	BG063100	Mm.35389	Energy/Metabolism
1008						
1009	H3002D03	gene prolyl oligopeptidase, exon 11, 12, 13, 14, 15 and cds	Mus musculus gene for prolyl oligopeptidase, exon 11, 12, 13, 14, 15 and complete cds	BG062950	Mm.90005	Energy/Metabolism

1010	H3002E05	"Mus musculus RAB1, member RAS oncogene family (Rab1), mRNA"			BG076435	Mm.14530	Signal Transduction
1011		dihydrolipoamide branched chain transacylase E2 (Dbt), mRNA	Mus musculus dihydrolipoamide branched chain transacylase E2 (Dbt), mRNA		BG076436	Mm.3636	Energy/Metabolism
1012	H3002E06	"Mus musculus aurora-related kinase 2 (ARK2) mRNA, complete cds"			BG076440	Mm.3488	Signal Transduction
1013		glutamate-cysteine ligase catalytic subunit (GLCLC)	Mus musculus glutamate-cysteine ligase catalytic subunit (GLCLC) mRNA, complete cds		BG076460	Mm.4368	Energy/Metabolism
1014	H3002G11	DHPS	Homo sapiens deoxyhypusine synthase (DHPS), mRNA		BG063127	Mm.28091	Energy/Metabolism
1015	H3003D05	BAG2	Homo sapiens BCL2-associated athanogene 2 (BAG2), mRNA		BG076597	Mm.22449	Apoptosis
1016		ribonucleotide reductase	Mouse DNA for M2 subunit of mouse ribonucleotide reductase (EC 1.17.4.1)		BG076613	Mm.99	Energy/Metabolism
1017	H3003F02	GluDH	Mus musculus glutamate dehydrogenase (GluDH), mRNA		BG076616	Mm.10600	Energy/Metabolism
1018	H3003F06	"Mus musculus calmodulin (Calm), mRNA"			BG076617	Mm.2648	Signal Transduction
1019	H3003F07	"Mus musculus adenylate cyclase 7 (Adcy7), mRNA"			BG076632	Mm.141400	Signal Transduction
1020	H3003H01	ISCU1 (ISCU), alternatively spliced	Homo sapiens ISCU1 (ISCU) mRNA, complete cds, alternatively spliced		BG076641	Mm.29497	Energy/Metabolism
1021		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA	Homo sapiens mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA		BG076643	Mm.86759	Energy/Metabolism
1022	H3004A02	ISCU1 (ISCU), alternatively spliced					
1023		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1024	H3004A04	ISCU1 (ISCU), alternatively spliced					
1025		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1026		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1027		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1028		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1029		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1030		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1031		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1032		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					
1033		mannosyl (alpha-1,3-)-glycoprotein beta-1,4-N-acetylglucosaminyltransferase, isoenzyme B (MGAT4B), mRNA					

1034			sarco(endo)plasmic reticulum calcium ATPase (SERCA2) gene, promoter region, exons 1-3, and partial cds	Mus musculus sarco(endo)plasmic reticulum calcium ATPase (SERCA2) gene, promoter region, exons 1-3, and partial cds	BG076647	Mm.100531	Energy/Metabolism
1035	H3004A09						
1036			"Mouse mRNA for peripheral-type benzodiazepine receptor, complete cds"		BG076653	Mm.1508	Signal Transduction
1037	H3004B06						
1038						Mm.34776	Heat Shock/Stress
1039	H3004C06						
1040			"Mus musculus group V phospholipase A2 mRNA, complete cds"		BG063219	Mm.153446	Signal Transduction
1041	H3004E03						
1042			"Mus musculus protein tyrosine phosphatase 4a2 (Ptp4a2), mRNA"		BG076689	Mm.6355	Signal Transduction
1043	H3004F07						
1044			orotidine-5-monophosphate decarboxylase, 3' end	Mouse orotidine-5-monophosphate decarboxylase mRNA, 3' end	BG076701	Mm.13145	Energy/Metabolism
1045	H3004G09						
1046			TF-1 apoptosis related protein 19	Mus musculus TF-1 apoptosis related protein 19 (Tfar19), mRNA	BG076705	Mm.21650	Apoptosis
1047	H3004H01						
1048			protein arginine N-methyltransferase 1 (Mfamt1), alternatively spliced	Mus musculus protein arginine N-methyltransferase 1 (Mfamt1) mRNA, complete cds, alternatively spliced	BG076710	Mm.27545	Energy/Metabolism
1049	H3004H06						
1050			H19 and muscle-specific Nctc1 genes, sequence	Mus musculus H19 and muscle-specific Nctc1 genes, complete sequence	BG076718	Mm.12970	Protein Synthesis/Translational Control
1051	H3005A04						
1052			"Mus musculus mammalian relative of DnaJ (Mrj-pending), mRNA"		BG076720	Mm.2701	Heat Shock/Stress
1053	H3005A06						

1054	H3005B03	thioredoxin reductase 1 (Txnrd1),	Mus musculus thioredoxin reductase 1 (Txnrd1), mRNA	BG076728	Mm.44552	Energy/Metabolism
1055						
1056	H3005B06	amidophosphoribosyltransferase	Rattus norvegicus mRNA for amidophosphoribosyltransferase	BG076730	Mm.27743	Energy/Metabolism
1057						
1058	H3005D01	dipeptidylpeptidase 4 (Dpp4),	Mus musculus dipeptidylpeptidase 4 (Dpp4), mRNA	BG076746	Mm.1151	Energy/Metabolism
1059						
1060		orotidine-5-monophosphate	Mouse orotidine-5-monophosphate			
1061	H3005D03	decarboxylase, 3 end	decarboxylase mRNA, 3 end	BG076748	Mm.802	Energy/Metabolism
1062						
1063	H3005E09	"Homo sapiens antiqutin 1 (ATQ1), mRNA"		BG076761	Mm.30250	Signal Transduction
1064						
1065	H3005E10	M.musculus sodium/potassium ATPase beta subunit	M.musculus mRNA for sodium/potassium ATPase beta subunit	BG076762	Mm.4550	Energy/Metabolism
1066						
1067	H3005F06	"Mus musculus pelle-like protein kinase mRNA, complete cds"		BG076768	Mm.38241	Signal Transduction
1068						
1069	H3005G01	glycerol-3-phosphate dehydrogenase	Mouse mRNA for glycerol-3-phosphate dehydrogenase, complete cds	BG076772	Mm.3711	Energy/Metabolism
1070						
1071	H3005G06	peptidylprolyl isomerase B (Ppib),	Mus musculus peptidylprolyl isomerase B (Ppib), mRNA	BG076776	Mm.2412	Energy/Metabolism
1072						
1073	H3005G12	methionyl tRNA synthetase	Homo sapiens mRNA for methionyl tRNA synthetase, complete cds	BG063326	Mm.28173	Energy/Metabolism
1074						
1075	H3006E03	cytochrome c-1 gene	Human cytochrome c-1 gene, complete cds	BG076814	Mm.29196	Apoptosis
1076						
1077	H3006E12	UDP-glucose:glycoprotein glucosyltransferase 1 (HUGT1),	Homo sapiens UDP-glucose:glycoprotein glucosyltransferase 1 (HUGT1), mRNA	BG076821	Mm.45651	Energy/Metabolism

1078				Mus musculus puromycin-sensitive aminopeptidase (Psa), mRNA	BG076835	Mm.29824	Energy/Metabolism
1079	H3006G03	puromycin-sensitive aminopeptidase (Psa),					
1080		"Mus musculus calmodulin synthesis (Cam) cDNA, complete cds"			BG076847	Mm.18041	Signal Transduction
1081	H3006H05						
1082		"Mus musculus circadian locomoter output cycles kaput (Clock), mRNA "			BG063409	Mm.3552	Signal Transduction
1083	H3006H10						
1084		glutathione S-transferase pi class (mGSTpiA) and (mGSTpiB) genes, complete cds			BG076872	Mm.426	Energy/Metabolism
1085	H3007E02						
1086						Mm.29713	Energy/Metabolism
1087	H3007G07						
1088					BG076882	Mm.10528	Energy/Metabolism
1089	H3007G08	histidyl tRNA synthetase (Hars),					
1090		H.sapiens gene 2-oxoglutarate carrier protein			BG076887	Mm.28466	Energy/Metabolism
1091	H3008A02						
1092		Mus musculus GTP-binding protein (mSara) homologue mRNA, complete cds			BG076890	Mm.6698	Signal Transduction
1093	H3008A05						
1094							
1095	H3008B05	Mus musculus dystroglycan 1 (DAG1) gene, exons 1 and 2 and complete cds			BG063514	Mm.7524	Matrix/Structural Proteins
1096							
1097	H3008B06	ferritin heavy chain (Fth),			BG063515	Mm.1776	Energy/Metabolism
1098							
1099	H3008B07						Energy/Metabolism
1100							
1101	H3008B10	ATPase, H ⁺ transporting, lysosomal I (Atp6i), mRNA			BG063518	Mm.19185	Energy/Metabolism

1102		"Mus musculus PKC α -interacting protein PICOT (PICOT) mRNA, complete cds"		BG076907	Mm.29675	Signal Transduction
1103	H3008C02					
1104	H3008C07	tryptophan-2,3-dioxygenase (TDO),	Mus musculus tryptophan-2,3-dioxygenase (TDO), mRNA	BG076911	Mm.21545	Energy/Metabolism
1105						
1106		"HSP90=heat shock protein [mice, heart, mRNA Partial, 806 nt]"		AW538216	Mm.2180	Heat Shock/Stress
1107	H3008C09					
1108			Mus musculus adenylosuccinate lyase (Adsl), mRNA	BG076914	Mm.38151	Energy/Metabolism
1109	H3008C12	adenylosuccinate lyase (Adsl),				Energy/Metabolism
1110						
1111	H3008D12					
1112		"Mus musculus caseinolytic protease, ATP-dependent, (E. coli) proteolytic subunit homolog (Clpp), mRNA"		BG076923	Mm.15243	Signal Transduction
1113	H3008E02					
1114					Mm.3991	Energy/Metabolism
1115	H3008F09	Mm.3991				
1116		Btk locus, alpha-D-galactosidase A (Ags), ribosomal protein (L44L), and Brutons tyrosine kinase (Btk) genes	Mus musculus Btk locus, alpha-D-galactosidase A (Ags), ribosomal protein (L44L), and Brutons tyrosine kinase (Btk) genes, complete cds		Mm.30034	Matrix/Structural Proteins
1117	H3008G05	Brutons tyrosine kinase (Btk) genes				
1118		M.musculus gene cathepsin D, exons 6-9	M.musculus gene for cathepsin D, exons 6-9	AW538365		Apoptosis
1119	H3008H06	9				
1120		serine palmitoyl transferase, subunit II gene; and unknown genes	Homo sapiens serine palmitoyl transferase, subunit II gene, complete cds; and unknown genes		Mm.29034	
1121	H3008H07	gene; and unknown genes				

1122	H3009A09	Slc20a1		Mus musculus gibbon ape leukemia virus receptor (Slc20a1) gene, exon 10 and complete cds	BG063583	Mm.16757	Energy/Metabolism
1123	H3009B04	Fen1		Mus musculus flap structure specific endonuclease 1 (Fen1), mRNA	BG063590	Mm.2952	Energy/Metabolism
1124	H3009C03	Tgm1		Mus musculus transglutaminase 1, K polypeptide (Tgm1), mRNA	BG076966	Mm.41964	Energy/Metabolism
1125	H3009C07		"Mus musculus heat shock protein, 86 kDa 1 (Hsp86-1), mRNA"		BG063605	Mm.1843	Heat Shock/Stress
1126	H3009D02	ATPase delta		Rattus norvegicus delta subunit of F1F0 ATPase gene, complete cds	BG076975	Mm.22514	Energy/Metabolism
1127	H3009E08	Cox8a		Mus musculus cytochrome c oxidase, subunit VIIIa (Cox8a), mRNA	BG076988	Mm.14022	Energy/Metabolism
1128	H3009G03		"Mus musculus lithium-sensitive myo-inositol monophosphatase A1 (IMPA1) mRNA, complete cds"		BG063641	Mm.8089	Signal Transduction
1129	H3010C12		mannosyl (alpha-1,6-)-glycoprotein beta-1,2-N-acetylglucosaminyltransferase (MGAT2),	Homo sapiens mannosyl (alpha-1,6-)-glycoprotein beta-1,2-N-acetylglucosaminyltransferase (MGAT2), mRNA	BG077070	Mm.24293	Energy/Metabolism
1130	H3010D10		tumor necrosis factor alpha converting enzyme (TACE) gene, exon 3, sequence	Mus musculus tumor necrosis factor alpha converting enzyme (TACE) gene, exon 3, complete sequence	BG077079	Mm.105014	Apoptosis
1131	H3010F06						Energy/Metabolism

11142				Mus musculus programmed cell death 6 interacting protein (Pcd6ip), mRNA	BG077095	Mm.29816	Apoptosis
11143	H3010F07	programmed cell death 6 interacting protein (Pcd6ip),					
11144				Mus musculus protein-L-isoaspartate (D-aspartate) O-methyltransferase 1 (Pcm1), mRNA	BG077121	Mm.25293	Energy/Metabolism
11145	H3011A03	protein-L-isoaspartate (D-aspartate) O-methyltransferase 1 (Pcm1),					
11146				H.sapiens mitogen inducible gene mig-2		Mm.29842	Signal Transduction
11147	H3011B01	H.sapiens mitogen inducible gene mig-2					Energy/Metabolism
11148							
11149	H3011C08	H3011C08				Mm.2368	
11150							
11151	H3011E06	mTim17a				Mm.21743	
11152							
11153	H3011E10	Sid329 (Sid329),		Mus musculus Sid329 (Sid329), mRNA			
11154		"House mouse mRNA for MAP kinase					
11155	H3011H09	kinase 3b, complete cds"			BG077180	Mm.57203	Signal Transduction
11156				Homo sapiens serine palmitoyl transferase, subunit II gene, complete cds; and unknown genes			
11157	H3012A05	serine palmitoyl transferase					
11158							
11159	H3012A07	"Mus musculus heat shock 70 protein (Hsc70) gene, complete cds"			BG077186	Mm.34184	Heat Shock/Stress
11160							
11161	H3012C06	"Mus musculus scavenger receptor class B type I (mSR-BI) mRNA, complete cds"			BG077202	Mm.4603	Heat Shock/Stress
11162				Homo sapiens glyoxalase I (GLO1), mRNA			
11163	H3012F03	GLO1			BG077218	Mm.17362	Energy/Metabolism
11164							
11165	H3012F10	"Mus musculus c-src tyrosine kinase (Csk), mRNA"			BG077222	Mm.21974	Signal Transduction

1166	H3012H04	"Mus musculus protein kinase Lkb1 (Lkb1) and R29144/1 genes, partial cds"			BG063794	Mm.29947	Signal Transduction
1167	H3013B02	M.musculus vacuolar adenosine triphosphatase subunit B	M.musculus mRNA for vacuolar adenosine triphosphatase subunit B		BG077252	Mm.10727	Energy/Metabolism
1170	H3013B08	pyridoxal (pyridoxine, vitamin B6) kinase (PDXK),	Homo sapiens pyridoxal (pyridoxine, vitamin B6) kinase (PDXK), mRNA		BG063905	Mm.26103	Energy/Metabolism
1171	H3013C04	"Mus musculus mRNA, complete cds"			AW539669	Mm.9846	Heat Shock/Stress
1173	H3013D03	"Mus musculus RAB10, member RAS oncogene family (Rab10), mRNA"			BG077272	Mm.21985	Signal Transduction
1175	H3013D11	Mouse metallothionein II (MT-II) gene			BG063925	Mm.89170	Heat Shock/Stress
1177	H3013E04	adenylyl cyclase-associated protein	Homo sapiens adenylyl cyclase-associated protein (CAP), mRNA			Mm.43660	
1179	H3013E07	dolichyl-phosphate alpha-N-acetylglucosaminophosphotransferase 2 (Dpagt2),	Mus musculus dolichyl-phosphate alpha-N-acetylglucosaminophosphotransferase 2 (Dpagt2), mRNA		BG063933	Mm.18353	Energy/Metabolism
1181	H3013F01	delta-aminolevulinic acid dehydratase (Lv),	Mus musculus delta-aminolevulinic acid dehydratase (Lv), mRNA		BG063937	Mm.6988	Energy/Metabolism
1183	H3013F02	"Mus musculus aurora-related kinase 1 (ARK1) mRNA, complete cds"			BG077290	Mm.11738	Signal Transduction
1185	H3013G10	survivin40, survivin121, and survivin140 genes, alternative splice products	Mus musculus survivin40, survivin121, and survivin140 genes, alternative splice products, complete cds		BG077309	Mm.8552	Apoptosis

1187	H3014A05	partial aminopeptidase B (APB gene)	Homo sapiens partial mRNA for aminopeptidase B (APB gene)	BG077324	Mm.29706	Energy/Metabolism
1188		"Rattus norvegicus protein associating with small stress protein PASS1 (Pass1) mRNA, complete cds"				
1189	H3014A06				Mm.45272	Heat Shock/Stress
1190		queine tRNA-ribosyltransferase	Mus musculus queine tRNA-ribosyltransferase (LOC60507), mRNA	BG077329	Mm.24178	Energy/Metabolism
1191	H3014A11	(LOC60507),			Mm.29849	Energy/Metabolism
1192	H3014B06	Mm.29849			Mm.2795	
1193		Mus musculus surfet gene 4 (Surf4), mRNA		BG063996		Heat Shock/Stress
1194	H3014C08					
1195						
1196	H3014C10					
1197		solute carrier family 28 (sodium-coupled nucleoside transporter), member 2 (Slc28a2), mRNA	Mus musculus solute carrier family 28 (sodium-coupled nucleoside transporter), member 2 (Slc28a2), mRNA	BG077361	Mm.29510	Energy/Metabolism
1198	H3014C12					
1199						
1200		UDP-Gal:betaGlcNAc beta 1,3-galactosyltransferase, polypeptide 4 (B3galt4),	Mus musculus UDP-Gal:betaGlcNAc beta 1,3-galactosyltransferase, polypeptide 4 (B3galt4), mRNA	BG077355	Mm.11132	Energy/Metabolism
1201	H3014E06					
1202		signal peptidase 21kDa subunit	Rattus norvegicus mRNA for signal peptidase 21kDa subunit, complete cds	BG077356	Mm.27800	Energy/Metabolism
1203	H3014E07					
1204	H3014F05	"Mus musculus S100 calcium-binding protein A13 (S100a13), mRNA"			Mm.6523	Signal Transduction
1205		UDP-Gal:betaGlcNAc beta 1,4-galactosyltransferase, polypeptide 1 (B4galt1),	Mus musculus UDP-Gal:betaGlcNAc beta 1,4-galactosyltransferase, polypeptide 1 (B4galt1), mRNA	BG077374	Mm.15622	Energy/Metabolism
1206	H3014F06					

1207									
1208	H3014G07	phosphoprotein enriched in astrocytes 15 (Pea15),	Mus musculus phosphoprotein enriched in astrocytes 15 (Pea15), mRNA	BG064035	Mm.544	Apoptosis			
1209									
1210	H3014G08	protease (prosome, macropain) 26S subunit, ATPase 5 (Psmc5),	Mus musculus protease (prosome, macropain) 26S subunit, ATPase 5 (Psmc5), mRNA	BG077385	Mm.665	Energy/Metabolism			
1211									
1212	H3014G09	protease (prosome, macropain) 26S subunit, ATPase 5 (Psmc5),	Mus musculus protease (prosome, macropain) 26S subunit, ATPase 5 (Psmc5), mRNA		Mm.665	Energy/Metabolism			
1213									
1214	H3014H07	tyrosyl-tRNA synthetase (YARS),	Homo sapiens tyrosyl-tRNA synthetase (YARS), mRNA	BG077395	Mm.20353	Energy/Metabolism			
1215									
1216	H3015A01	major histocompatibility locus class III region:butyrophilin-like protein gene, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, palmitoyl-protein thioestera	Mus musculus major histocompatibility locus class III region:butyrophilin-like protein gene, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, palmitoyl-protein thioestera		Mm.27416				
1217									
1218	H3015B03	hypothetical protein FLJ10535 (FLJ10535),	Homo sapiens hypothetical protein FLJ10535 (FLJ10535), mRNA	BG077413	Mm.24187	Energy/Metabolism			
1219									
1220	H3015C02	methionine adenosyltransferase alpha subunit gene fragment	Homo sapiens methionine adenosyltransferase alpha subunit gene fragment	BG064075	Mm.29815	Energy/Metabolism			
1221									
1222	H3015D05	MSTP029	Homo sapiens MSTP029 mRNA, complete cds	BG077438	Mm.30147	Energy/Metabolism			
1223									
1224	H3015E06	Tnf receptor-associated factor 1 (Traf1),	Mus musculus Tnf receptor-associated factor 1 (Traf1), mRNA	BG064103	Mm.12898	Apoptosis			
1225									
1226	H3016C10					Heat Shock/Stress			

1227	H3016D01	Mm.20201							Energy/Metabolism
1228									
1229									
1230	H3016D08	BCI2/adenovirus E1B 19 kDa-interacting protein 3-like (Bnip3l), mRNA				BG077518	Mm.29820		Apoptosis
1231									
1232		Mus musculus mG28K mRNA for GTP-binding protein like 1, complete cds				BG077528	Mm.28954		
1233									
1234	H3016F03	Tim44					Mm.34791		Matrix/Structural Proteins
1235									
1236	H3016F07	M. musculus glutamyl-tRNA synthetase				BG064194	Mm.27190		Energy/Metabolism
1237	H3016F11								Heat Shock/Stress
1238									
1239	H3017A02	ornithine decarboxylase antizyme 2 (Oaz2), mRNA				BG077570	Mm.675		Energy/Metabolism
1240									
1241	H3017C11	"Mus musculus RAN guanine nucleotide release factor (Rangrf-pending), mRNA"				BG077598	Mm.143774		Signal Transduction
1242									
1243	H3017D04	"Homo sapiens hect (homologous to the E6-AP (UBE3A) carboxyl terminus) domain and RCC1 (CHC1)-like domain (RLD) 1 (HERC1), mRNA"				BG064250	Mm.102717		Heat Shock/Stress
1244									
1245	H3017E04	"Mus musculus cathepsin Z, precursor (CtSz) mRNA, complete cds"				BG077611	Mm.115		Signal Transduction
1246									
1247	H3017E11	"Mus musculus retinoblastoma binding protein 7 (Rbbp7), mRNA"				AW544081	Mm.1603		Heat Shock/Stress

1248			phenylalanyl tRNA synthetase beta subunit (Fr5b)	Mus musculus phenylalanyl tRNA synthetase beta subunit (Fr5b) mRNA, complete cds	BG077633	Mm.28922	Energy/Metabolism
1249	H3017G06						
1250				Mus musculus beta-1,4-galactosyltransferase III (B4galT3), mRNA	BG077551	Mm.150720	Energy/Metabolism
1251	H3018A02	B4galT3					
1252				Homo sapiens partial mRNA for aminopeptidase B (APB gene)	BG077553		Energy/Metabolism
1253	H3018A04	APB					
1254			"Mus musculus Cctq gene for chaperonin containing TCP-1 theta subunit, complete cds"				
1255	H3018A08						
1256				Mus musculus cytochrome P450, 17 (Cyp17), mRNA	BG064304	Mm.17989	Heat Shock/Stress
1257	H3018A11	Cyp17			BG064307	Mm.1262	Energy/Metabolism
1258				Mus musculus thimet oligopeptidase mRNA, complete cds	BG077656	Mm.26995	Energy/Metabolism
1259	H3018B08	thimet oligopeptidase					
1260							
1261	H3018F06						Heat Shock/Stress
1262				Homo sapiens UDP-galactose 4 epimerase (GALE) gene, complete cds			
1263	H3018G08	UDP-galactose 4 epimerase (GALE)			BG077710	Mm.20363	Energy/Metabolism
1264	H3019A07	ATP binding protein associated with cell differentiation (APACD),		Homo sapiens ATP binding protein associated with cell differentiation (APACD), mRNA			
1265				Mus musculus ATPase, Na+/K+-transporting, beta 1 polypeptide (Atp1b1), mRNA	Mm.28438		Energy/Metabolism
1266	H3019B01	ATPase, Na+/K+-transporting, beta 1 polypeptide (Atp1b1),			BG077733	Mm.4550	Energy/Metabolism
1267				acyl-coenzyme A:cholesterol acyltransferase [mice, peritoneal macrophages, , 3041 nt]			
1268	H3019B03	acyl-coenzyme A:cholesterol acyltransferase [mice, peritoneal macrophages, , 3041 nt]		acyl-coenzyme A:cholesterol acyltransferase [mice, peritoneal macrophages, mRNA, 3041 nt]	BG077735	Mm.28099	Matrix/Structural Proteins

1269	H3019B10	Mus musculus microtubule-associated protein 4 (Mtap4), mRNA			BG077742	Mm.12625	Matrix/Structural Proteins
1270							
1271	H3019C06	CGI-107 protein (LOC51012), mRNA		Homo sapiens CGI-107 protein (LOC51012), mRNA		Mm.30065	
1272							
1273		core1 UDP-galactose:N-acetyl galactosamine-alpha-R beta 1,3-		Mus musculus core1 UDP-galactose:N-acetyl galactosamine-alpha-R beta 1,3-galactosyltransferase (C1galt1) mRNA, complete cds	BG077752	Mm.102752	Energy/Metabolism
1274	H3019C11	galactosyltransferase (C1galt1)					
1275		"Mus musculus GTP-binding protein (mSara) homologue mRNA, complete cds"			BG077753	Mm.6698	Signal Transduction
1276	H3019C12						
1277		"Mus musculus protein kinase C inhibitor (mPKCI) mRNA, complete cds"			BG077758	Mm.425	Signal Transduction
1278	H3019D09						
1279						Mm.38994	Energy/Metabolism
1280	H3019E05	Mm.38994					
1281				Homo sapiens F1F0-type ATP synthase subunit d mRNA, complete cds	BG077769	Mm.102755	Energy/Metabolism
1282	H3019E12	F1F0-type ATP synthase subunit d					
1283					BG077774	Mm.1318	Signal Transduction
1284	H3019F05	Mouse tyrosine kinase (c-abl) mRNA					
1285		domesticus tumor necrosis factor receptor p60 homologue 1 (Tnfrh1 gene)		Mus musculus domesticus mRNA for tumor necrosis factor receptor p60 homologue 1 (Tnfrh1 gene)	BG077775	Mm.103353	Apoptosis
1286	H3019F06						
1287							
1288	H3019F07	"Mus musculus serine/threonine kinase 10 (Stk10), mRNA"			BG077776	Mm.8235	Signal Transduction
1289							
1290	H3019F10	phosphomannomutase 2 (Pmm2),					Energy/Metabolism

1291	H3019G05	alkaline phosphatase 2, liver (Akp2),	Mus musculus phosphomannomutase 2 (Pmm2), mRNA	BG077784	Mm.9699	Energy/Metabolism
1292	H3019H07	ATPase-like vacuolar proton channel (Atp1),	Mus musculus alkaline phosphatase 2, liver (Akp2), mRNA	BG077796	Mm.1265	Energy/Metabolism
1295	H3019H11	H3019F10	Mus musculus ATPase-like vacuolar proton channel (Atp1), mRNA	BG077799	Mm.30155	Energy/Metabolism
1296	H3020A02	nucleoside diphosphatase (ER-UDPase gene)	Mus musculus mRNA for nucleoside diphosphatase (ER-UDPase gene)	BG077800	Mm.10211	Energy/Metabolism
1299	H3020A07	serine palmitoyl transferase, subunit II gene; and unknown genes	Homo sapiens serine palmitoyl transferase, subunit II gene, complete cds; and unknown genes		Mm.22626	
1301	H3020B08	ferritin light chain 1 (Ftl),	Mus musculus ferritin light chain 1 (Ftl), mRNA	BG077812	Mm.7500	Energy/Metabolism
1303	H3020C02	"Mouse metallothionein-I (MT-I) gene, 5' end"		BG077818	Mm.2041	Heat Shock/Stress
1305	H3020D10	isocitrate dehydrogenase 3 (NAD+)	Homo sapiens isocitrate dehydrogenase 3 (NAD+) alpha (IDH3A), mRNA	BG077913	Mm.29051	Energy/Metabolism
1306	H3020E01	"Mus musculus wagneri gene for 105-kDa heat shock protein, exon 18 and complete cds"		BG064500	Mm.34828	Heat Shock/Stress
1309	H3020F04	squalene epoxidase (Sqle),	Mus musculus squalene epoxidase (Sqle), mRNA	BG077950	Mm.22663	Energy/Metabolism
1311	H3020H07	BALB/c GDP-dissociation inhibitor	Mus musculus BALB/c GDP-dissociation inhibitor (GDI-1) mRNA, partial cds	BG077953	Mm.28084	Energy/Metabolism
1312						

1313	H3020H10	man 6-P receptor (46MPR)	Mouse man 6-P receptor (46MPR) mRNA, complete cds	BG064540	Mm.1358	Energy/Metabolism
1314	H3021A02	programmed cell death 6 (Pdc6),	Mus musculus programmed cell death 6 (Pdc6), mRNA	BG077957	Mm.24254	Apoptosis
1317	H3021A11	small zinc finger-like protein (Tim13)	Mus musculus small zinc finger-like protein (Tim13) mRNA, complete cds	BG077964	Mm.22201	Energy/Metabolism
1318	H3021A12	M.musculus (clone S5) WRS tryptophan--tRNA ligase	M.musculus (clone S5) WRS mRNA for tryptophan--tRNA ligase	BG077965	Mm.38433	Energy/Metabolism
1321	H3021B05	M.musculus Cl-23 kD gene	M.musculus Cl-23 kD gene	BG077969	Mm.44227	Energy/Metabolism
1323	H3021B08	mitochondrial carrier peroxisomal membrane protein, 34 kDa member			Mm.306	
1324	H3021C09	"Mus musculus proliferin related protein (Plfr), mRNA"				Apoptosis
1327	H3021D07	vacuolar adenosine triphosphatase subunit A gene	Mus musculus vacuolar adenosine triphosphatase subunit A gene, complete cds	BG077825	Mm.3258	Signal Transduction
1329	H3021E11	aspartyl aminopeptidase (Dnpep),	Mus musculus aspartyl aminopeptidase (Dnpep), mRNA	BG077839	Mm.24680	Energy/Metabolism
1331	H3021F08	"Mus musculus chaperonin subunit 7 (Cct7), mRNA"		BG077843	Mm.914	Heat Shock/Stress
1335	H3021G03	"Mus musculus serine/threonine protein phosphatase type 1 alpha mRNA, complete cds"		BG077848	Mm.1970	Signal Transduction

1337	H3021H03	"Mus musculus Ras suppressor protein 1 (Rsu1), mRNA"			BG077860	Mm.905	Signal Transduction
1338							
1339	H3022A04	Cricetus griseus Phosphatidylglycerophosphate synthase complete cds			BG064623	Mm.28864	Energy/Metabolism
1340							
1341	H3022A05	"Mus musculus RAB23, member RAS oncogene family (Rab23), mRNA"			BG077872	Mm.40644	Signal Transduction
1342							
1343	H3022B12	ribonuclease P (14kD) (RPP14),			BG064641	Mm.41801	Energy/Metabolism
1344							
1345	H3022D02	dolichyl-phosphate beta-glucosyltransferase			BG064654	Mm.27890	Energy/Metabolism
1346							
1347	H3022D03	galactokinase gene			BG064655	Mm.2820	Energy/Metabolism
1348							
1349	H3022D09	beta-glucuronidase gene			BG077995	Mm.3317	Energy/Metabolism
1350							
1351	H3022E01	GLUT4 vesicle protein, partial cds			BG064664	Mm.29010	Energy/Metabolism
1352							
1353	H3022E09	a disintegrin-like and metalloprotease (reprolysin type) with thrombospondin type 1 motif, 4 (ADAMTS4), mRNA			BG078006	Mm.102791	Energy/Metabolism
1354							
1355	H3022F06	malic enzyme, supernatant (Mod1),			BG064680	Mm.29998	Energy/Metabolism
1356							
1357	H3022G02	26S protease ATPase (mss1), partial cds			BG078023	Mm.2462	Energy/Metabolism
1358							

1359	H3022G03	26S protease ATPase (mss1), partial cds	Mus musculus 26S protease ATPase (mss1) mRNA, partial cds	BG078024	Mm.2462	Energy/Metabolism
1360						
1361	H3022H03	serine/threonine kinase 17b (apoptosis-inducing) (STK17B),	Homo sapiens serine/threonine kinase 17b (apoptosis-inducing) (STK17B), mRNA	BG078034	Mm.25559	Apoptosis
1362						
1363	H3022H06	"Mouse serine/threonine phosphatase-2C (PP2C) mRNA, complete cds"		BG064691	Mm.849	Signal Transduction
1364						
1365	H3023A10	folypolyglutamate synthetase precursor (Fpgs)	Mus musculus folypolyglutamate synthetase precursor (Fpgs) mRNA, complete cds	BG064717	Mm.3830	Energy/Metabolism
1366						
1367	H3023B01					Heat Shock/Stress
1368						
1369	H3023B11	"Mouse mRNA for HSP60 protein (clones 3T3-7, -9, and -M1)"		BG064728	Mm.1777	Heat Shock/Stress
1370						
1371	H3023B12	Mouse cDNA for heat shock protein 65		BG064729	Mm.1777	Heat Shock/Stress
1372						
1373	H3023C05	Homo sapiens nuclear receptor binding protein (NRBP), mRNA		BG064733	Mm.22029	
1374						
1375	H3023C07	peroxiredoxin 5 (Prdx5),	Mus musculus peroxiredoxin 5 (Prdx5), mRNA	BG064735	Mm.6587	Energy/Metabolism
1376						
1377	H3023C08	ribonucleotide reductase M1 (Rrm1),	Mus musculus ribonucleotide reductase M1 (Rrm1), mRNA	BG064736	Mm.656	Energy/Metabolism
1378						
1379	H3023C09	Mm.29735			Mm.29735	Energy/Metabolism
1380						
1381	H3023D06	Mus musculus phosphoglycerate kinase processed pseudogene		BG064745	Mm.188	Signal Transduction
1382						

1383 1384	H3023D08	glutamate pyruvate transaminase (GPT) gene	Human glutamate pyruvate transaminase (GPT) gene, complete cds	BG064747	Mm.30130	Energy/Metabolism
1385 1386	H3023D09	partial xylosyltransferase II (XT-II gene)	Mus musculus partial mRNA for xylosyltransferase II (XT-II gene)	BG078081	Mm.100638	Energy/Metabolism
1387 1388	H3023E11	SDHD gene small subunit of cytochrome b of succinate dehydrogenase	Homo sapiens SDHD gene for small subunit of cytochrome b of succinate dehydrogenase, complete cds	BG078095	Mm.10406	Energy/Metabolism
1389 1390	H3023F02	"Mus musculus phosphatidylinositol 4-phosphate 5-kinase, type 1 beta (Pip5k1b), mRNA"		BG064765	Mm.3191	Signal Transduction
1391 1392	H3023F07	"Mus musculus Ccte gene for chaperonin containing TCP-1 epsilon subunit, complete cds"		BG064769	Mm.1813	Heat Shock/Stress
1393 1394	H3023F08	"Mus musculus Ccte gene for chaperonin containing TCP-1 epsilon subunit, complete cds"		BG064770	Mm.1813	Heat Shock/Stress
1395 1396	H3023F09	glucosamine-6-phosphate deaminase (Gnpda)	Mus musculus glucosamine-6-phosphate deaminase (Gnpda) mRNA, complete cds	BG064771	Mm.22374	Energy/Metabolism
1397 1398	H3023F10	"Mus musculus heat shock protein, 86 kDa 1 (Hsp86-1), mRNA"		BG064772	Mm.1843	Heat Shock/Stress
1399 1400	H3023F12	"Mus musculus heat shock protein, 86 kDa 1 (Hsp86-1), mRNA"		BG064774	Mm.1843	Heat Shock/Stress
1401 1402	H3023G01	"Mus musculus heat shock protein, 86 kDa 1 (Hsp86-1), mRNA"		BG064775	Mm.1843	Heat Shock/Stress

1403	H3023G05	phosphoribosyl pyrophosphate synthetase 1 (Prps1),	Mus musculus phosphoribosyl pyrophosphate synthetase 1 (Prps1), mRNA	BG064779	Mm.25198	Energy/Metabolism
1404						
1405	H3023H09	ferritin L-subunit gene exons 1-4	Mus musculus ferritin L-subunit gene exons 1-4, complete cds	BG064794	Mm.7500	Energy/Metabolism
1406						
1407	H3023H10	ferritin L-subunit gene exons 1-4	Mus musculus ferritin L-subunit gene exons 1-4, complete cds	BG064795	Mm.7500	Energy/Metabolism
1408						
1409	H3023H11	ferritin L-subunit gene exons 1-4	Mus musculus ferritin L-subunit gene exons 1-4, complete cds	BG064796	Mm.7500	Energy/Metabolism
1410						
1411	H3023H12	lactate dehydrogenase 1, A chain (Ldh1),	Mus musculus lactate dehydrogenase 1, A chain (Ldh1), mRNA	BG064797	Mm.26504	Energy/Metabolism
1412						
1413	H3024A02	polymerase, gamma (Polg),	Mus musculus polymerase, gamma (Polg), mRNA	BG064799	Mm.3616	DNA Replication
1414						
1415	H3024A06	alcohol dehydrogenase 5 (Adh5),	Mus musculus alcohol dehydrogenase 5 (Adh5), mRNA	BG064803	Mm.3874	Energy/Metabolism
1416						
1417	H3024A11	DNA M2 subunit of ribonucleotide reductase (EC 1.17.4.1)	Mouse DNA for M2 subunit of mouse ribonucleotide reductase (EC 1.17.4.1)	BG078138	Mm.99	Energy/Metabolism
1418						
1419	H3024B03	"Mus musculus chaperonin subunit 3 (gamma) (Cct3), mRNA"		BG064811	Mm.3576	Heat Shock/Stress
1420						
1421	H3024B04	"Mus musculus chaperonin subunit 3 (gamma) (Cct3), mRNA"		BG064812	Mm.3576	Heat Shock/Stress
1422						
1423	H3024B05	"Mus musculus chaperonin subunit 3 (gamma) (Cct3), mRNA"		BG064813	Mm.3576	Heat Shock/Stress
1424						
1425	H3024B06	"Mus musculus chaperonin subunit 3 (gamma) (Cct3), mRNA"		BG064814	Mm.3576	Heat Shock/Stress
1426						
1427	H3024B12					Heat Shock/Stress

1428	H3024C02	"Homo sapiens oxidative-stress responsive 1 (OSR1), mRNA"			BG078151	Mm.52786	Heat Shock/Stress
1429							
1430	H3024C04	phosphoglycerate mutase 1 (Pgaml)	Mus musculus phosphoglycerate mutase 1 (Pgaml) mRNA, complete cds		BG064823	Mm.16783	Energy/Metabolism
1431							
1432	H3024C07	HEXA gene, exons 2 - 14	M.musculus HEXA gene, exons 2 - 14		BG064825	Mm.2284	Energy/Metabolism
1433							
1434	H3024C11	"Mus musculus heat shock protein, 86 kDa 1 (Hsp86-1), mRNA"			BG064829	Mm.1843	Heat Shock/Stress
1435							
1436	H3024E08	direct IAP binding protein with low PI	Mus musculus direct IAP binding protein with low PI mRNA, complete cds		BG064850	Mm.46716	Apoptosis
1437							
1438	H3024F05	Mus musculus putative CCAAT binding factor 1 (mCBF) mRNA, alternatively spliced transcript mCBF1, complete cds			BG064857	Mm.24169	Transcription/Chromatin
1439							
1440	H3024F06	serine hydroxymethyl transferase 1 (soluble) (Shmt1),	Mus musculus serine hydroxymethyl transferase 1 (soluble) (Shmt1), mRNA		BG078187	Mm.45993	Energy/Metabolism
1441							
1442	H3024F07	fumarate hydratase (FH),	Homo sapiens fumarate hydratase (FH), mRNA		BG064859	Mm.41502	Energy/Metabolism
1443							
1444	H3024G02	phosphoribosyl pyrophosphate synthetase 1 (Prps1),	Mus musculus phosphoribosyl pyrophosphate synthetase 1 (Prps1), mRNA		BG064866	Mm.25198	Energy/Metabolism
1445							
1446	H3024G03	K+- channel, sequence	Rattus norvegicus K+- channel mRNA, sequence		BG078196	Mm.40482	Energy/Metabolism
1447							
1448	H3024G07	Murine L-myc gene			BG064871	Mm.1055	Signal Transduction
1449							
1450	H3024H02	"Mus musculus p53 binding protein 1 mRNA, partial cds"			BG078205	Mm.25231	Signal Transduction
1451							

1452			"Mus musculus breast heat shock 73					
1453	H3024H12		protein (hsc73) mRNA, complete cds"			BG064886	Mm.2944	Heat Shock/Stress
1454			"Mus musculus interferon alpha					
1455	H3025A01		responsive protein (15 kDa) (Ifg15), mRNA"			BG078215	Mm.21761	Heat Shock/Stress
1456								
1457	H3025C05		malate dehydrogenase, soluble (Mor2),		Mus musculus malate dehydrogenase, soluble (Mor2), mRNA	BG064914	Mm.3156	Energy/Metabolism
1458								
1459	H3025D10		Aga=aspartylglucosaminidase [mice, liver, brain, Partial, 1191 nt]		Aga=aspartylglucosaminidase [mice, liver, brain, mRNA Partial, 1191 nt]	BG064929	Mm.41591	Energy/Metabolism
1460								
1461	H3025E07		ADP-ribosylarginine hydrolase		Mus musculus ADP-ribosylarginine hydrolase mRNA, complete cds	BG064935	Mm.20047	Energy/Metabolism
1462								
1463	H3025F10		succinate dehydrogenase Ip subunit, partial cds		Mus musculus succinate dehydrogenase Ip subunit mRNA, partial cds	BG064949	Mm.29141	Energy/Metabolism
1464								
1465	H3026B03		HSPC145 protein (HSPC145),		Homo sapiens HSPC145 protein (HSPC145), mRNA		Mm.29904	
1466								
1467	H3026B04		phosphoribosyl pyrophosphate amidotransferase (PPAT),		Homo sapiens phosphoribosyl pyrophosphate amidotransferase (PPAT), mRNA	BG064988	Mm.27743	Energy/Metabolism
1468								
1469	H3026B06		Mm.100588				Mm.100588	Energy/Metabolism
1470								
1471	H3026B07		ADP-ribosylation factor 1 (Arl1),		Mus musculus ADP-ribosylation factor 1 (Arl1), mRNA	BG078294	Mm.6836	Energy/Metabolism
1472								
1473	H3026B11		ATPase, Cu++ transporting, beta polypeptide (Atp7b),		Mus musculus ATPase, Cu++ transporting, beta polypeptide (Atp7b), mRNA	BG078297	Mm.102506	Energy/Metabolism

1474	H3026D06	tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, eta polypeptide (Ywhah),	Mus musculus tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, eta polypeptide (Ywhah), mRNA	BG065012	Mm.3308	Energy/Metabolism
1476	H3026D10	"Mus musculus heat shock protein, DNAAJ-like 2 (Hsj2), mRNA"		BG065015	Mm.27897	Heat Shock/Stress
1478	H3026E07	cDNA FLJ12225 fis, clone MAMMA1001139, weakly similar to SRE-2 PROTEIN	Homo sapiens cDNA FLJ12225 fis, clone MAMMA1001139, weakly similar to SRE-2 PROTEIN	BG078316	Mm.12983	Energy/Metabolism
1480	H3026F02	M. musculus GSHPx gene	M. musculus GSHPx gene	BG065030	Mm.1090	Energy/Metabolism
1482	H3026F05	acetyl-Coenzyme A dehydrogenase, short chain (Acads),	Mus musculus acetyl-Coenzyme A dehydrogenase, short chain (Acads), mRNA	BG065033	Mm.18759	Energy/Metabolism
1484	H3026F06	H.sapiens phosphoenolpyruvate carboxykinase	H.sapiens mRNA for phosphoenolpyruvate carboxykinase	BG078326	Mm.29856	Energy/Metabolism
1486	H3026F07	"Mus musculus Ccch gene for chaperonin containing TCP-1 eta subunit, complete cds"		BG065035	Mm.914	Heat Shock/Stress
1488	H3026F08	"Mus musculus Ccch gene for chaperonin containing TCP-1 eta subunit, complete cds"		BG065036	Mm.914	Heat Shock/Stress
1490	H3026G10	mannose phosphate isomerase (MPI),	Homo sapiens mannose phosphate isomerase (MPI), mRNA	BG078342	Mm.34830	Energy/Metabolism
1492	H3026H09	methionine adenosyltransferase alpha subunit gene fragment	Homo sapiens methionine adenosyltransferase alpha subunit gene fragment	BG065061	Mm.29815	Energy/Metabolism

1494		puromycin-sensitive aminopeptidase		Mus musculus puromycin-sensitive aminopeptidase (Psa), mRNA	BG065063	Mm.29824	Energy/Metabolism
1495	H3026H11						
1496		ATPase-like vacuolar proton channel		Mus musculus ATPase-like vacuolar proton channel (Atp1), mRNA	BG065073	Mm.30155	Energy/Metabolism
1497	H3027A10						
1498		"Homo sapiens SH3-domain binding protein 4 (SH3BP4), mRNA"			BG078369	Mm.62046	Signal Transduction
1499	H3027B02						
1500		transient receptor potential-related protein (Chak),		Mus musculus transient receptor potential-related protein (Chak), mRNA	BG065092	Mm.33819	Energy/Metabolism
1501	H3027C06						
1502		uridine phosphorylase (Upp),		Mus musculus uridine phosphorylase (Upp), mRNA	BG065114	Mm.4610	Energy/Metabolism
1503	H3027E05						
1504		alpha-enolase (2-phospho-D-glycerate hydrolase) (EC 4.2.1.11)		Mouse mRNA for alpha-enolase (2-phospho-D-glycerate hydrolase) (EC 4.2.1.11)	BG078408	Mm.90587	Energy/Metabolism
1505	H3027E07						
1506		alpha-enolase (2-phospho-D-glycerate hydrolase) (EC 4.2.1.11)		Mouse mRNA for alpha-enolase (2-phospho-D-glycerate hydrolase) (EC 4.2.1.11)	BG078409	Mm.90587	Energy/Metabolism
1507	H3027E08						
1508		alpha-enolase (2-phospho-D-glycerate hydrolase) (EC 4.2.1.11)		Mouse mRNA for alpha-enolase (2-phospho-D-glycerate hydrolase) (EC 4.2.1.11)	BG078410	Mm.90587	Energy/Metabolism
1509	H3027E09						
1510		aspartyl-tRNA synthetase (DARS),		Homo sapiens aspartyl-tRNA synthetase (DARS), mRNA	BG078414	Mm.28693	Energy/Metabolism
1511	H3027F02						
1512		"Murine MAP kinase kinase 6c mRNA, complete cds"			BG065128	Mm.14487	Signal Transduction
1513	H3027F07						
1514		"Mus musculus Cctd gene for chaperonin containing TCP-1 delta subunit, complete cds"			BG078424	Mm.6821	Heat Shock/Stress
1515	H3027F12						

1516	H3027H04	"Homo sapiens heat shock protein 75 (TRAP1), mRNA"			BG078439	Mm.38470	Heat Shock/Stress
1517							
1518	H3028A03	peptidylprolyl isomerase A (Ppia),		Mus musculus peptidylprolyl isomerase A (Ppia), mRNA	BG078450	Mm.5246	Energy/Metabolism
1519							
1520	H3028A04	peptidylprolyl isomerase A (Ppia),		Mus musculus peptidylprolyl isomerase A (Ppia), mRNA	BG078451	Mm.5246	Energy/Metabolism
1521							
1522	H3028A09	BTB and CNC homology 2 (Bach2),		Mus musculus BTB and CNC homology 2 (Bach2), mRNA	BG065166	Mm.21908	Energy/Metabolism
1523							
1524							
1525	H3028B03	adenine nucleotide translocase-2 (Ant2)		Mus musculus adenine nucleotide translocase-2 (Ant2) mRNA, complete cds		Mm.658	Energy/Metabolism
1526							
1527	H3028C09	"Mus musculus adenosine kinase (Adk), mRNA"			BG065190	Mm.19352	Signal Transduction
1528							
1529	H3028E01	death associated protein 3 (DAP-3 gene)		Mus musculus mRNA for death associated protein 3 (DAP-3 gene)	BG078504	Mm.29028	Apoptosis
1530							
1531	H3028E04	"Mus musculus protein phosphatase 2 (formerly 2A), regulatory subunit A (PR 65), alpha isoform (Ppp2r1a), mRNA"			BG078507	Mm.1034	Signal Transduction
1532							
1533	H3028F04	"Mus musculus cathepsin L (Ctsl), mRNA"			BG078497	Mm.930	Signal Transduction
1534							
1535	H3028F05	kidney ornithine decarboxylase, clone pODC16, 3 end		Mouse kidney ornithine decarboxylase mRNA, clone pODC16, 3 end	BG065221	Mm.15259	Energy/Metabolism
1536							
1537	H3028F06	"Mus musculus RAB17, member RAS oncogene family (Rab17), mRNA"			BG078499	Mm.46396	Signal Transduction
1538							
1539	H3028H11	"Mus musculus cathepsin H (Ctsh), mRNA"			BG065250	Mm.2277	Signal Transduction

1540		peroxisomal trans 2-enoyl CoA reductase	Mus musculus peroxisomal trans 2-enoyl CoA reductase mRNA, complete cds	BG065254	Mm.29988	Energy/Metabolism
1541	H3029A03					
1542			Mus musculus cellular apoptosis susceptibility protein mRNA, complete cds	BG065256	Mm.22417	Apoptosis
1543	H3029A05	cellular apoptosis susceptibility protein				
1544		natural resistance associated macrophage protein-2 (Nramp2), C-terminal exon alternative splice variant	Mus musculus natural resistance associated macrophage protein-2 (Nramp2) mRNA, C-terminal exon alternative splice variant, complete cds	BG065264	Mm.1304	Energy/Metabolism
1545	H3029B01					
1546		"Mus musculus chaperonin subunit 3 (gamma) (Cet3), mRNA"		BG078552	Mm.27804	Heat Shock/Stress
1547	H3029B02					
1548		NADH dehydrogenase (ubiquinone) 1, subcomplex unknown, 2 (14.5kD, B14.5b) (NDUFC2),	Homo sapiens NADH dehydrogenase (ubiquinone) 1, subcomplex unknown, 2 (14.5kD, B14.5b) (NDUFC2), mRNA	BG078565	Mm.1893	Energy/Metabolism
1549	H3029C05					
1550						Heat Shock/Stress
1551	H3029C06					
1552		"Mus musculus Son of sevenless homolog 1, (Drosophila) (Sos1), mRNA"		BG065298	Mm.6357	Signal Transduction
1553	H3029E04					
1554		nuclear mitotic apparatus protein 1 (NUMA1),	Homo sapiens nuclear mitotic apparatus protein 1 (NUMA1), mRNA		Mm.102520	
1555	H3029G12					
1556	H3030A03	Mouse cDNA for heat shock protein 65		BG078626	Mm.1777	Heat Shock/Stress
1557						
1558	H3030B07				Mm.1776	Heat Shock/Stress
1559		"Mus musculus activin receptor IIB (Acvr2b), mRNA"				
1560	H3030C05			BG065366	Mm.8940	Signal Transduction

1561		"Mus musculus nucleoside diphosphate kinase A long form mRNA, complete cds"			BG078650	Mm.1260	Signal Transduction
1562	H3030C06						Energy/Metabolism
1563	H3030C11	H3030C11					
1564							
1565							
1566	H3030D10	pyruvate kinase M		Mus musculus mRNA for pyruvate kinase M, complete cds	BG078663	Mm.2635	Energy/Metabolism
1567							
1568	H3030D11	pyruvate kinase M		Mus musculus mRNA for pyruvate kinase M, complete cds	BG078664	Mm.2635	Energy/Metabolism
1569							
1570	H3030E04	Mm.26022				Mm.26022	Energy/Metabolism
1571							
1572	H3030E05	glycine decarboxylase (P-protein)		Human glycine decarboxylase (P-protein) mRNA	BG078669	Mm.27953	Energy/Metabolism
1573							
1574	H3030E06	glycine decarboxylase (P-protein)		Human glycine decarboxylase (P-protein) mRNA	BG078670	Mm.27953	Energy/Metabolism
1575							
1576	H3030E10	"Mus musculus cathepsin B (Ctsb), mRNA"			BG078674	Mm.22753	Signal Transduction
1577							
1578	H3030F09	Homo sapiens protein phosphatase 3 (formerly 2B), catalytic subunit, beta isoform (calcineurin A beta) (PPP3CB), mRNA			AW537455	Mm.142697	Matrix/Structural Proteins
1579							
1580	H3030G01	Cochlear (clone 20F5)		M.musculus partial cochlear mRNA (clone 20F5)	BG078685	Mm.43671	Energy/Metabolism
1581							
1582	H3030G08	ATP synthase alpha subunit		Mouse ATP synthase alpha subunit, complete cds	BG078689	Mm.4069	Energy/Metabolism
1583							
1584	H3030G09	"Mus musculus Ca2+-independent phospholipase A2 long form mRNA, complete cds"			BG065409	Mm.117103	Signal Transduction

1585	H3030H02	Bckdk		Mus musculus branched chain ketoacid dehydrogenase kinase (Bckdk), mRNA	BG078694	Mm.8903	Signal Transduction
1586							
1587	H3031A11	"Mus musculus protein kinase C substrate 80K-H (Pkcsh), mRNA"			BG078710	Mm.70272	Signal Transduction
1588							
1589	H3031B06	cytosolic aminopeptidase P		Homo sapiens cytosolic aminopeptidase P mRNA, complete cds	BG078715	Mm.99776	Energy/Metabolism
1590							
1591	H3031C05	PIS1 gene phosphatidylinositol synthase cds		Rattus norvegicus PIS1 gene for phosphatidylinositol synthase, complete cds	BG065447	Mm.28219	Energy/Metabolism
1592							
1593	H3031C09	"Mus musculus putative intracellular signaling protein (Trip6) mRNA, complete cds"			BG078729	Mm.27063	Signal Transduction
1594							
1595	H3031C12	Mus musculus N-myc downstream regulated 1 (Ndr1), mRNA			BG078732	Mm.4063	Transcription/Chromatin
1596							
1597	H3031D03	aldolase 1, A isom (Aldol),		Mus musculus aldolase 1, A isoform (Aldol), mRNA	BG065457	Mm.16763	Energy/Metabolism
1598							
1599	H3031E10	S-adenosylhomocysteine hydrolase (Ahey),		Mus musculus S-adenosylhomocysteine hydrolase (Ahey), mRNA	BG065475	Mm.2573	Energy/Metabolism
1600							
1601	H3031E11	glyceraldehyde-3-phosphate dehydrogenase (Gapd),		Mus musculus glyceraldehyde-3-phosphate dehydrogenase (Gapd), mRNA	BG065476	Mm.5289	Energy/Metabolism
1602							
1603	H3031E12	fatty acid desaturase 1 (FADS1),		Homo sapiens fatty acid desaturase 1 (FADS1), mRNA	BG078755	Mm.30158	Energy/Metabolism
1604							
1605	H3031F01	ubiquinol-cytochrome c reductase core protein I (UQCRC1),		Homo sapiens ubiquinol-cytochrome c reductase core protein I (UQCRC1), mRNA	BG065478	Mm.972	Energy/Metabolism
1606							

1607	H3031F08	"Mus musculus heat shock protein 40 (HSPF1), mRNA"		BG065483	Mm.2982	Heat Shock/Stress
1608						
1609	H3031F12	M.musculus aspartate aminotransferase gene exon 10 and 3-flank	M.musculus aspartate aminotransferase gene exon 10 and 3-flank	BG078765	Mm.149089	Energy/Metabolism
1610						
1611						
1612	H3031G06	"Mus musculus heat shock protein, 110 kDa (Hsp110), mRNA"		BG065493	Mm.1032	Heat Shock/Stress
1613						
1614	H3031G08	Mm.93266			Mm.93266	Energy/Metabolism
1615						
1616	H3031G11	ATPase, H+ transporting, lysosomal (vacuolar proton pump) 9kD (ATP6H),	Homo sapiens ATPase, H+ transporting, lysosomal (vacuolar proton pump) 9kD (ATP6H), mRNA	BG078776	Mm.22602	Energy/Metabolism
1617						
1618	H3031H09	5-3 exoribonuclease 2 (Xrn2),	Mus musculus 5-3 exoribonuclease 2 (Xrn2), mRNA	BG065507	Mm.3065	Energy/Metabolism
1619						
1620	H3032A01	hypothetical protein PRO1197	Homo sapiens hypothetical protein PRO1197 (PRO1197), mRNA	BG065511	Mm.24565	Energy/Metabolism
1621						
1622	H3032A08	"Mus musculus heat shock 70kD protein 5 (glucose-regulated protein, 78kD) (Hspa5), mRNA"		BG078795	Mm.918	Heat Shock/Stress
1623						
1624	H3032A09	peroxisomal integral membrane protein PMP34	Mus musculus mRNA for peroxisomal integral membrane protein PMP34		Mm.306	Matrix/Structural Proteins
1625						
1626	H3032A12	glucose-6-phosphate dehydrogenase X-linked (G6pdx),	Mus musculus glucose-6-phosphate dehydrogenase X-linked (G6pdx), mRNA	BG078799	Mm.27210	Energy/Metabolism
1627						
1628	H3032C01	cytochrome c gene (MCI)	Mouse cytochrome c gene (MCI)	BG078810	Mm.35389	Energy/Metabolism

1629	H3032C10	3-hydroxy-3-methylglutaryl-Coenzyme A reductase (HMGCR),	Homo sapiens 3-hydroxy-3-methylglutaryl-Coenzyme A reductase (HMGCR), mRNA	BG078816	Mm.2226	Energy/Metabolism
1630						
1631	H3032H02	phosphatidylcholine transfer protein-like (Pctpl),	Mus musculus phosphatidylcholine transfer protein-like (Pctpl), mRNA	BG078855	Mm.28896	Energy/Metabolism
1632						
1633	H3033A10	R. norvegicus gene 6-phosphofructo-2-kinase/fructose-2,6-biphosphatase (EC 2.7.1.105/EC 3.1.3.46)	R. norvegicus gene for 6-phosphofructo-2-kinase/fructose-2,6-biphosphatase (EC 2.7.1.105/EC 3.1.3.46)	BG078872		Energy/Metabolism
1634						
1635	H3033B08	cytochrome c oxidase, subunit IV (Cox4),	Mus musculus cytochrome c oxidase, subunit IV (Cox4), mRNA	BG078879	Mm.2136	Energy/Metabolism
1636						
1637	H3033B11	serine protease inhibitor 3 (Spi3),	Mus musculus serine protease inhibitor 3 (Spi3), mRNA	BG078882	Mm.147649	Energy/Metabolism
1638						
1639	H3033C02	"Mus musculus serine/threonine kinase (sak-a) mRNA, complete cds"		BG078885	Mm.3794	Signal Transduction
1640						
1641	H3033E10	ectonucleotide pyrophosphatase/phosphodiesterase 1 (Enpp1),	Mus musculus ectonucleotide pyrophosphatase/phosphodiesterase 1 (Enpp1), mRNA	BG065640	Mm.27254	Energy/Metabolism
1642						
1643	H3034B11	ATP-binding cassette, sub-family B (MDR/TAP), member 12 ABC-me			Mm.143731	Energy/Metabolism
1644						
1645	H3035A01	tumor necrosis factor, alpha-induced protein 2 (Tnfai2),	Mus musculus tumor necrosis factor, alpha-induced protein 2 (Tnfai2), mRNA	BG065761	Mm.4348	Apoptosis
1646						
1647	H3035B03	Mm.32746			Mm.32746	Energy/Metabolism
1648						
1649	H3035D08	Mouse gene for beta-2-adrenergic receptor		BG079067	Mm.5598	Signal Transduction
1650						

1651			"Mus musculus RNA-binding protein isoform G3BP-2a (G3BP2) mRNA, complete cds"			BG065817	Mm.2411	Signal Transduction
1652	H3035F02							
1653			"Mus musculus Rho guanine nucleotide exchange factor (GEF) 1 (Arhgef1), mRNA"			BG079136	Mm.3181	Signal Transduction
1654	H3036B11							
1655			"Mus musculus lysophosphatidic acid receptor (vzg-1) mRNA, complete cds"			BG079186	Mm.4772	Signal Transduction
1656	H3036H01							
1657			kinesin-like 6 (mitotic centromere-associated kinesin) (KNSL6),		Homo sapiens kinesin-like 6 (mitotic centromere-associated kinesin) (KNSL6), mRNA			
1658	H3037B01						Mm.27828	Cell Cycle
1659			serine protease inhibitor, Kunitz type 1 (Spint1),		Mus musculus serine protease inhibitor, Kunitz type 1 (Spint1), mRNA			
1660	H3037F06					BG079254	Mm.104955	Energy/Metabolism
1661			"Mus musculus cAMP-specific phosphodiesterase 4A (Pde4a) gene, exons 2 through 8 and PDE4A isoform					
1662	H3037G12		1 exon 1"			BG066005	Mm.154704	Signal Transduction
1663			"Mus musculus interferon alpha responsive protein (15 kDa) (Ifrg15), mRNA"					
1664	H3038A06					BG079287	Mm.21761	Heat Shock/Stress
1665			potassium voltage-gated channel, delayed-rectifier, subfamily S, member		Homo sapiens potassium voltage-gated channel, delayed-rectifier, subfamily S, member 3 (KCNS3), mRNA			
1666	H3038C073		(KCNS3),			BG079311	Mm.113278	Energy/Metabolism
1667			phosphoribosyl pyrophosphate synthetase-associated protein 2		Homo sapiens phosphoribosyl pyrophosphate synthetase-associated protein 2 (PRPSAP2), mRNA			
1668	H3038C09		(PRPSAP2),			BG079313	Mm.27703	Energy/Metabolism

1669	H3038E03	PRKC, apoptosis, WT1, regulator	Homo sapiens PRKC, apoptosis, WT1, regulator (PAWR), mRNA	BG079331	Mm.6617	Apoptosis
1670						
1671	H3038E05	Mus musculus growth differentiation factor 3 (Gdf3), mRNA		BG079333	Mm.4213	Signal Transduction
1672						
1673	H3038E10	methy/transferase COQ3 (COQ3),	Homo sapiens methy/transferase COQ3 (COQ3), mRNA	BG066071	Mm.5662	Energy/Metabolism
1674						
1675	H3039A05	"Mus musculus regulator of G-protein signaling 11 mRNA, partial cds"		BG079374	Mm.13264	Signal Transduction
1676						
1677	H3039B09	"Mus musculus serine/threonine kinase receptor associated protein (Strap), mRNA"		BG066121	Mm.22584	Signal Transduction
1678						
1679	H3039C11	"Mus musculus receptor tyrosine kinase (Dtk) mRNA, complete cds"		BG066134	Mm.2901	Signal Transduction
1680						
1681	H3039D02	asparaginyl-tRNA synthetase (NARS),	Homo sapiens asparaginyl-tRNA synthetase (NARS), mRNA	BG079401	Mm.29192	Energy/Metabolism
1682						
1683	H3039E07	isocitrate dehydrogenase 3 (NAD+) beta (IDH3B),	Homo sapiens isocitrate dehydrogenase 3 (NAD+) beta (IDH3B), mRNA	C78231	Mm.29590	Energy/Metabolism
1684						
1685	H3039E08	"Mus musculus SH3-containing protein SH3P2 mRNA, partial cds"		BG079417	Mm.4165	Signal Transduction
1686						
1687	H3039F05	ornithine aminotransferase (Oat),	Mus musculus ornithine aminotransferase (Oat), mRNA	BG079424	Mm.42187	Energy/Metabolism
1688						
1689	H3039G04	M.musculus seryl-tRNA synthetase (SERS), 5 end	M.musculus seryl-tRNA synthetase (SERS) mRNA, 5 end	BG079434	Mm.28688	Energy/Metabolism
1690						

1691				Mus musculus 5-3 exoribonuclease 1 (Xrn1), mRNA	BG079441	Mm.5703	Energy/Metabolism
1692	H3039G12	5-3 exoribonuclease 1 (Xrn1),					
1693		"Mus musculus calponin 2 (Cnn2),					
1694	H3039H01	mRNA"			BG079442	Mm.21776	Signal Transduction
1695							
1696	H3039H05	Mus musculus putative CCAAT binding factor 1 (mCBF) mRNA, alternatively spliced transcript mCBF1, complete cds			BG079446	Mm.24169	
1697				Mouse adenine phosphoribosyltransferase (APRT), complete cds			
1698	H3040A04	adenine phosphoribosyltransferase (APRT)			BG079455	Mm.1786	Energy/Metabolism
1699							
1700	H3040E11	palmitoyl-protein thioesterase (Ppt),		Mus musculus palmitoyl-protein thioesterase (Ppt), mRNA		Mm.153740	
1701							
1702	H3041A02	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 10 (42kD) (NDUFA10),		Homo sapiens NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 10 (42kD) (NDUFA10), mRNA	BG079485	Mm.28293	Energy/Metabolism
1703							
1704	H3041A04	lysyl-tRNA synthetase (KARS),		Homo sapiens lysyl-tRNA synthetase (KARS), mRNA	BG066271	Mm.29949	Energy/Metabolism
1705							
1706	H3041B11	mevalonate pyrophosphate decarboxylase		Rattus norvegicus mevalonate pyrophosphate decarboxylase mRNA, complete cds	BG079503	Mm.28146	Energy/Metabolism
1707							
1708	H3041F09	glucose transporter (GLUTX1 gene)		Mus musculus mRNA for glucose transporter (GLUTX1 gene)	BG066327	Mm.7241	Energy/Metabolism
1709							
1710	H3041G03	solute carrier family 15 (H+/peptide transporter), member 2 (Slc15a2),		Mus musculus solute carrier family 15 (H+/peptide transporter), member 2 (Slc15a2), mRNA	BG079545	Mm.63479	Energy/Metabolism

1711			protease (prosome, macropain) 26S subunit, ATPase 5 (Psmc5), mRNA	Mus musculus protease (prosome, macropain) 26S subunit, ATPase 5 (Psmc5), mRNA	BG079550	Mm.665		Energy/Metabolism
1712	H3041G08							
1713			major histocompatibility complex region NG27, NG28, RPS28, NADH oxidoreductase, NG29, KIFC1, Fas-binding protein, BING1, tapasin, RalGDS-like, KE2, BING4, beta 1,3-galactosyl transferase	Mus musculus major histocompatibility complex region NG27, NG28, RPS28, NADH oxidoreductase, NG29, KIFC1, Fas-binding protein, BING1, tapasin, RalGDS-like, KE2, BING4, beta 1,3-galactosyl transferase	BG079557	Mm.14808		Energy/Metabolism
1714	H3041H03							
1715								
1716	H3042A05		BCL2-associated athanogene 4 (BAG4), mRNA	Homo sapiens BCL2-associated athanogene 4 (BAG4), mRNA	BG066354	Mm.27102		Apoptosis
1717								
1718	H3042C08		"Mus musculus dual specificity phosphatase 10 (Dusp10), mRNA"		BG079592	Mm.34912		Signal Transduction
1719								
1720	H3042D02		brain cDNA, clone MNCb-2243, similar to Bcl2-associated athanogene 3 (Bag3), mRNA	Mus musculus brain cDNA, clone MNCb-2243, similar to Mus musculus Bcl2-associated athanogene 3 (Bag3), mRNA	BG079597	Mm.28373		Apoptosis
1721								
1722	H3042F12		serine protease inhibitor 4 (Spi4), mRNA	Mus musculus serine protease inhibitor 4 (Spi4), mRNA	BG079624	Mm.3093		Energy/Metabolism
1723								
1724	H3042G07		Mouse heat-shock protein hsp84 mRNA		BG079631	Mm.2180		Heat Shock/Stress
1725								
1726	H3043A03		"Mus musculus casein kinase II, alpha 1, related sequence 4 (Csnk2a1-rs4), mRNA"		BG066436	Mm.23692		Signal Transduction
1727								
1728	H3043F09		Mus musculus GNB3 gene for GTP-binding protein beta3 subunit, complete cds		BG066499	Mm.22228		
1729								
1730	H3043F12		ferrochelatase (Fech), mRNA	Mus musculus ferrochelatase (Fech), mRNA	BG066502	Mm.1070		

1731		"Mus musculus Cctd gene for chaperonin containing TCP-1 delta subunit, complete cds"					
1732	H3044B01					BG079699	Mm.36431
1733					Mus musculus protease (prosome, macropain) 28 subunit, alpha (Psmel), mRNA		
1734	H3044E06	protease (prosome, macropain) 28 subunit, alpha (Psmel),				BG066650	Mm.830
1735							Energy/Metabolism
1736	H3044G06	A10 , partial cds			Mus musculus A10 mRNA, partial cds	BG066673	Mm.16898
1737							Energy/Metabolism
1738	H3045B02	cytosolic aminopeptidase P			Homo sapiens cytosolic aminopeptidase P mRNA, complete cds	BG079790	Mm.99776
1739							Energy/Metabolism
1740	H3045B03	Mm.23710					Mm.23710
1741							Energy/Metabolism
1742	H3045B12	solute carrier family 12, member 7 (Slc12a7),			Mus musculus solute carrier family 12, member 7 (Slc12a7), mRNA		
1743						BG079799	Mm.155195
1744	H3045D07	NAALADase II protein			Homo sapiens mRNA for NAALADase II protein		Energy/Metabolism
1745						BG079815	Mm.7060
1746	H3045D08	Mm.25054					Energy/Metabolism
1747							Energy/Metabolism
1748	H3045E05	serine protease OMI (Omi),			Mus musculus serine protease OMI (Omi), mRNA		Mm.25054
1749						BG079822	Mm.21880
1750	H3046A03	DKFZP566O084 protein (DKFZP566O084),			Homo sapiens DKFZP566O084 protein (DKFZP566O084), mRNA		Energy/Metabolism
1751						BG079861	Mm.21475
1752	H3046A12	programmed cell death protein 7 (Pcdcd7),			Mus musculus programmed cell death protein 7 (Pcdcd7), mRNA		Energy/Metabolism
1753						BG066710	Mm.29193
1754	H3046C10	isopenentenyl-diphosphate delta isomerase (IDI1),			Homo sapiens isopenentenyl-diphosphate delta isomerase (IDI1), mRNA		Apoptosis
1755							
1756	H3047B07	tripeptidyl peptidase II (Tpp2),			Mus musculus tripeptidyl peptidase II (Tpp2), mRNA	BG079889	Mm.29847
						BG066807	Mm.28867
							Energy/Metabolism

1757	H3047D01	Bos taurus creatine kinase	Bos taurus mRNA for creatine kinase, complete cds	BG079988	Mm.970	Energy/Metabolism
1758	H3047D05	gene encoding enoyl-CoA hydratase, exons 5,6 & 7	H. sapiens gene encoding enoyl-CoA hydratase, exons 5,6 & 7	BG079992	Mm.24452	Energy/Metabolism
1761	H3047F02	vacuolar-adenosine triphosphatase (V-ATPase)	Mus musculus mRNA for vacuolar-adenosine triphosphatase (V-ATPase), complete cds	BG079910	Mm.25079	Energy/Metabolism
1763	H3047G12	C7-1 protein (C7-1)	Rattus norvegicus C7-1 protein (C7-1) mRNA, complete cds	C80679	Mm.21961	Energy/Metabolism
1765	H3048A05	isoprenylcysteine carboxyl methyltransferase (ICMT),	Homo sapiens isoprenylcysteine carboxyl methyltransferase (ICMT), mRNA	BG080028	Mm.44565	Energy/Metabolism
1767	H3048B11	cytochrome c oxidase, subunit VIIc (Cox7c),	Mus musculus cytochrome c oxidase, subunit VIIc (Cox7c), mRNA	BG080036	Mm.24165	Energy/Metabolism
1769	H3048E06	small zinc finger-like protein DDP2	Mus musculus small zinc finger-like protein DDP2 (Ddp2) mRNA, complete cds	BG080049	Mm.30718	Energy/Metabolism
1771	H3048G11	biliverdin reductase B (flavin reductase (NADPH)) (BLVRB),	Homo sapiens biliverdin reductase B (flavin reductase (NADPH)) (BLVRB), mRNA	BG066946	Mm.24021	Energy/Metabolism
1773	H3049D07	"Mus musculus Janus kinase 2 (Jak2), mRNA"		BG080085	Mm.25112	Signal Transduction
1775	H3049F02	carbonyl reductase 3 (CBR3),	Homo sapiens carbonyl reductase 3 (CBR3), mRNA	BG067014	Mm.4512	Energy/Metabolism
1777	H3049G02	solute carrier family 16 (monocarboxylic acid transporters), member 1 (Slc16a1),	Mus musculus solute carrier family 16 (monocarboxylic acid transporters), member 1 (Slc16a1), mRNA	BG067025	Mm.9086	Energy/Metabolism
1779	H3049G04	"Mus musculus B-cell leukemia/lymphoma 10 (Bcl10), mRNA"		BG067027	Mm.28782	Signal Transduction

1781	H3049G07	PGES prostaglandin E synthase	Mus musculus PGES mRNA for prostaglandin E synthase, complete cds	BG067030	Mm.154682	Energy/Metabolism
1782						
1783	H3050A12	mannosidase 1, beta (Man1b),	Mus musculus mannosidase 1, beta (Man1b), mRNA	BG080131	Mm.103874	Energy/Metabolism
1784						
1785						
1786	H3050B11	small zinc finger-like protein (Tim13)	Mus musculus small zinc finger-like protein (Tim13) mRNA, complete cds	BG080141	Mm.142132	Energy/Metabolism
1787						
1788	H3050C02	glutathione synthetase (Gss),	Mus musculus glutathione synthetase (Gss), mRNA	BG067069	Mm.7504	Energy/Metabolism
1789						
1790	H3050E05	putative dimethyladenosine transferase (HSA9761),	Homo sapiens putative dimethyladenosine transferase (HSA9761), mRNA	BG080168	Mm.9563	Energy/Metabolism
1791						
1792	H3050E08	diaphorase (NADH) (cytochrome b-5 reductase) (DIA1),	Homo sapiens diaphorase (NADH) (cytochrome b-5 reductase) (DIA1), mRNA	BG080169	Mm.22560	Energy/Metabolism
1793						
1794	H3050F12	hydroxysteroid 17-beta dehydrogenase 4 (Hsd17b4),	Mus musculus hydroxysteroid 17-beta dehydrogenase 4 (Hsd17b4), mRNA	BG080183	Mm.9569	Energy/Metabolism
1795						
1796	H3050G05	solute carrier family 7 (cationic amino acid transporter, y+ system), member 2 (Slc7a2),	Mus musculus solute carrier family 7 (cationic amino acid transporter, y+ system), member 2 (Slc7a2), mRNA	BG067114	Mm.4676	Energy/Metabolism
1797						
1798	H3050H06	"Mus musculus interferon regulatory factor 1 (Irf1), mRNA"		BG067127	Mm.1246	Heat Shock/Stress
1799						
1800	H3050H11	Mm.25374			Mm.25374	Energy/Metabolism
1801						
1802	H3051C06				Mm.7730	Heat Shock/Stress
1803						
1804	H3051C07	"Mus musculus phospholipase D2 gene, exons 13 through 25 and complete cds"		BG080231	Mm.2538	Signal Transduction

1805		cDNA FLJ13488 fis, clone PLACE1003915, weakly similar to PROBABLE ARGINYL-TRNA SYNTHETASE, CYTOPLASMIC (EC 6.1.1.19)	Homo sapiens cDNA FLJ13488 fis, clone PLACE1003915, weakly similar to PROBABLE ARGINYL-TRNA SYNTHETASE, CYTOPLASMIC (EC 6.1.1.19)	BG080243	Mm.22363	
1806	H3051D07	aldehyde reductase 6, renal (Aldr6r-pending), mRNA	Mus musculus aldehyde reductase 6, renal (Aldr6r-pending), mRNA	BG080253	Mm.21268	Energy/Metabolism
1807	H3051E06	Mus musculus growth differentiation factor 9 (Gdf9), mRNA		BG080261	Mm.9593	Signal Transduction
1808	H3051F02	guanosine monophosphate reductase (GMPR), mRNA	Homo sapiens guanosine monophosphate reductase (GMPR), mRNA	BG080277	Mm.25808	Energy/Metabolism
1809	H3051G07	potassium channel regulator 1	Rattus norvegicus potassium channel regulator 1 mRNA, complete cds	BG067226		Energy/Metabolism
1810	H3052A03	malate dehydrogenase, soluble (Mor2), mRNA	Mus musculus malate dehydrogenase, soluble (Mor2), mRNA	BG067227	Mm.3156	Energy/Metabolism
1811	H3052A04	ATP-binding cassette, sub-family B (MDR/TAP), member 1 (Abcb1), mRNA	Mus musculus ATP-binding cassette, sub-family B (MDR/TAP), member 1 (Abcb1), mRNA	BG080311	Mm.6404	Energy/Metabolism
1812	H3052B06	coproporphyrinogen oxidase (Cpo), mRNA	Mus musculus coproporphyrinogen oxidase (Cpo), mRNA	BG080324	Mm.35820	Energy/Metabolism
1813	H3052C08	"Mus musculus adenylate kinase 2" (Ak2), mRNA		BG067269	Mm.29460	Signal Transduction
1814	H3052D11					

1823 1824	H3052H05	"Homo sapiens rab3 GTPase-activating protein, non-catalytic subunit (150kD) (RAB3-GAP150), mRNA"		BG080373	Mm.28344	Signal Transduction
1825 1826	H3052H11	asparaginyl-tRNA synthetase (NARS), mRNA	Homo sapiens asparaginyl-tRNA synthetase (NARS), mRNA	BG080379	Mm.29192	Energy/Metabolism
1827 1828	H3053A12	"Mus musculus regulator of G-protein signaling 2 mRNA, complete cds"		BG080390	Mm.28262	Signal Transduction
1829 1830	H3053B07	tyrosine hydroxylase (Th), mRNA	Mus musculus tyrosine hydroxylase (Th), mRNA	BG067326	Mm.140599	Energy/Metabolism
1831 1832	H3053C02	phosphoribosyl pyrophosphate synthetase-associated protein 1 (PRPSAP1), mRNA	Homo sapiens phosphoribosyl pyrophosphate synthetase-associated protein 1 (PRPSAP1), mRNA	BG080402	Mm.25125	Energy/Metabolism
1833 1834	H3053C09	"Mus musculus nicotinic acetylcholine receptor alpha 5 subunit (Acr5) mRNA, partial cds"		BG080409		Signal Transduction
1835 1836	H3053E04	"Mus musculus calponin 1 (Cnn1), mRNA"		BG067357	Mm.4356	Signal Transduction
1837 1838	H3053G12	"Mus musculus polynucleotide kinase 3'-phosphatase (Pnkp), mRNA"		BG067384	Mm.29545	Signal Transduction
1839 1840	H3053H06	citrin (Slc25a13) mRNA, complete cds	Mus musculus citrin (Slc25a13) mRNA, complete cds	BG083930	Mm.2124	Energy/Metabolism
1841 1842	H3054B05	"Mus musculus folate receptor 3 (Folbp3) mRNA, complete cds"		BG080476	Mm.86738	Signal Transduction
1843 1844	H3054B12	Nrf2	Mus musculus p45 NF-E2 related factor 2 (Nrf2) mRNA, complete cds	BG067417	Mm.1025	

1823 1824	H3052H05	"Homo sapiens rab3 GTPase-activating protein, non-catalytic subunit (150kD) (RAB3-GAP150), mRNA"		BG080373	Mm.28344	Signal Transduction
1825 1826	H3052H11	Homo sapiens asparaginyl-tRNA synthetase (NARS), mRNA		BG080379	Mm.29192	Energy/Metabolism
1827 1828	H3053A12	"Mus musculus regulator of G-protein signaling 2 mRNA, complete cds"		BG080390	Mm.28262	Signal Transduction
1829 1830	H3053B07	tyrosine hydroxylase (Th), mRNA	Mus musculus tyrosine hydroxylase (Th), mRNA	BG067326	Mm.140599	Energy/Metabolism
1831 1832	H3053C02	phosphoribosyl pyrophosphate synthetase-associated protein 1 (PRPSAP1), mRNA	Homo sapiens phosphoribosyl pyrophosphate synthetase-associated protein 1 (PRPSAP1), mRNA	BG080402	Mm.25125	Energy/Metabolism
1833 1834	H3053C09	"Mus musculus nicotinic acetylcholine receptor alpha 5 subunit (Acr5) mRNA, partial cds"		BG080409		Signal Transduction
1835 1836	H3053E04	"Mus musculus calponin 1 (Cnn1), mRNA"		BG067357	Mm.4356	Signal Transduction
1837 1838	H3053G12	"Mus musculus polynucleotide kinase 3'-phosphatase (Pnkp), mRNA"		BG067384	Mm.29545	Signal Transduction
1839 1840	H3053H06	citrin (Slc25a13)	Mus musculus citrin (Slc25a13) mRNA, complete cds	BG083930	Mm.2124	Energy/Metabolism
1841 1842	H3054B05	"Mus musculus folate receptor 3 (Folbp3) mRNA, complete cds"		BG080476	Mm.86738	Signal Transduction
1843 1844	H3054B12	Nrf 2	Mus musculus p45 NF-E2 related factor 2 (Nrf2) mRNA, complete cds	BG067417	Mm.1025	

1863		major histocompatibility locus class III region:butyrophilin-like protein gene, partial cds; Notch4, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, palmitoyl-protein thioesterase	Mus musculus major histocompatibility locus class III region:butyrophilin-like protein gene, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, palmitoyl-protein thioesterase			
1864	H3055B08	palmitoyl-protein thioesterase			Mm.1511	
1865		inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase beta				
1866	H3055B10	[IKK[b]]IKK2[IKK-2][IKK-beta			Mm.28269	Energy/Metabolism
1867		"Mus musculus Ras-GTPase-activating protein SH3-domain binding protein (G3bp-pending), mRNA"				
1868	H3055C04	(G3bp-pending), mRNA"		BG080577	Mm.2038	Signal Transduction
1869		"Homo sapiens inositol 1,3,4-trisphosphate 5/6 kinase (ITPK1), mRNA"				
1870	H3055C05	mRNA"		BG080578		Signal Transduction
1871						
1872	H3055C10	ATP/GTP-binding protein (HEAB),	Homo sapiens ATP/GTP-binding protein (HEAB), mRNA	BG080583	Mm.21583	Energy/Metabolism
1873		aldolase B, fructose-bisphosphate				
1874	H3055D02	(ALDOB),	Homo sapiens aldolase B, fructose-bisphosphate (ALDOB), mRNA	BG080587	Mm.87581	Energy/Metabolism
1875						
1876	H3055E07	TRAF family member associated NF-kappa B activator (TANK)	Mus musculus TRAF family member associated NF-kappa B activator (TANK) mRNA, complete cds	BG080604	Mm.1803	Apoptosis
1877						
1878	H3055F07	delta-aminolevulinatase dehydratase (Lv),	Mus musculus delta-aminolevulinatase dehydratase (Lv), mRNA	BG080616	Mm.90076	Energy/Metabolism
1879						
1880	H3055G02	dipeptidyl peptidase I precursor	Mus musculus dipeptidyl peptidase I precursor mRNA, complete cds	BG080623	Mm.684	Energy/Metabolism

1881	H3056A09	"M.musculus mRNA for inositol 1,4,5-trisphosphate receptor (type 2)"			BG067589	Mm.7800	Signal Transduction
1882							
1883	H3056C11	DKFZP564O2082 protein	Homo sapiens DKFZP564O2082 protein (DKFZP564O2082), mRNA			Mm.21826	
1884							
1885	H3056D03	"Homo sapiens calponin 3, acidic (CNN3), mRNA"			BG080757	Mm.22171	Signal Transduction
1886							
1887	H3056G10	thioredoxin 2 (TRX2)	Homo sapiens thioredoxin 2 (TRX2) mRNA, complete cds		BG080633	Mm.3533	Energy/Metabolism
1888							
1889	H3056H05	H3056H05					Energy/Metabolism
1890							
1891	H3057C01	"Mus musculus interferon-related developmental regulator 1 (Ifrd1), mRNA"			BG067699	Mm.168	Heat Shock/Stress
1892							
1893	H3057C08	GPX3				Mm.7156	Energy/Metabolism
1894							
1895	H3057C10	bisphosphate 3-nucleotidase 1 (Bpnt1),	Mus musculus bisphosphate 3-nucleotidase 1 (Bpnt1), mRNA		BG067708	Mm.18096	Energy/Metabolism
1896							
1897	H3057D09	acetyl-Coenzyme A carboxylase beta (ACACB),	Homo sapiens acetyl-Coenzyme A carboxylase beta (ACACB), mRNA		BG067718	Mm.88548	Energy/Metabolism
1898							
1899	H3057E05	"Mus musculus protein tyrosine phosphatase, non-receptor type 21 (Ptpn21), mRNA"			BG080698	Mm.4420	Signal Transduction
1900							
1901	H3057F01	"Mus musculus casein kinase 1, epsilon (Csnk1e), mRNA"			BG080793	Mm.30199	Signal Transduction
1902							
1903	H3057H04	"Mus musculus HSP40-like protein mRNA, partial sequence"			BG080820	Mm.46746	Heat Shock/Stress
1904							

1905			solute carrier family 16 (monocarboxylic acid transporters), member 2 (Slc16a2), mRNA	Mus musculus solute carrier family 16 (monocarboxylic acid transporters), member 2 (Slc16a2), mRNA	C87415	Mm.5045	Energy/Metabolism
1906	H3057H06						
1907			Fas-interacting serine/threonine kinase 3 (Fist3)	Mus musculus Fas-interacting serine/threonine kinase 3 (Fist3) mRNA, complete cds	BG080836	Mm.29026	Apoptosis
1908	H3058A10						
1909							
1910	H3058C03		Bcl2-like 10 (Bcl2l10), mRNA	Mus musculus Bcl2-like 10 (Bcl2l10), mRNA	BG080862	Mm.25988	Apoptosis
1911			"Mus musculus Jun oncogene (Jun), mRNA"				
1912	H3058C09				BG080846	Mm.482	Signal Transduction
1913			"Mus musculus guanine nucleotide binding protein (G protein), gamma 3 subunit (Gng3), mRNA"				
1914	H3058D09				BG080868	Mm.27307	Signal Transduction
1915			transient receptor potential-related protein (Chak), mRNA	Mus musculus transient receptor potential-related protein (Chak), mRNA	BG080898	Mm.143646	Energy/Metabolism
1916	H3058G06						
1917			sodium bicarbonate cotransporter isoform 3 (NBC-3), mRNA	Mus musculus sodium bicarbonate cotransporter isoform 3 (NBC-3), mRNA	BG067865	Mm.34957	Energy/Metabolism
1918	H3059A10						
1919			"Homo sapiens regulator of G-protein signalling 12 (RGS12), mRNA"		BG067869	Mm.31378	Signal Transduction
1920	H3059B02						
1921			"Mus musculus protein kinase C delta mRNA, complete cds"		BG080928	Mm.142839	Signal Transduction
1922	H3059B03						
1923			"Mus sp. JAK1 protein tyrosine kinase mRNA, complete cds"				
1924	H3059B07				BG067874	Mm.28598	Signal Transduction
1925							
1926	H3059D07		alanyl-tRNA synthetase (AARS), mRNA	Homo sapiens alanyl-tRNA synthetase (AARS), mRNA	BG080951	Mm.24174	Energy/Metabolism

1927	H3059D11	KIAA1093 protein, partial cds	Homo sapiens mRNA for KIAA1093 protein, partial cds	BG067897	Mm.22829	Apoptosis
1928						
1929	H3059F12	"Mus musculus GTP binding protein (GTP2) mRNA, complete cds"		BG067921	Mm.15793	Signal Transduction
1930						
1931	H3059G11	intronless glutamine synthetase gene	Mouse intronless glutamine synthetase gene, complete cds	BG067932	Mm.41660	Energy/Metabolism
1932						
1933	H3060A10	M.musculus arachidonate epidermis-type 12(S)-lipoxygenase	M.musculus mRNA for arachidonate epidermis-type 12(S)-lipoxygenase	BG067951	Mm.1122	Energy/Metabolism
1934						
1935		"Homo sapiens mitogen-activated protein kinase kinase kinase 5 (MAP4K5), mRNA"				
1936	H3060B09			BG081019	Mm.24022	Signal Transduction
1937						
1938	H3060D04	Mm.24594			Mm.24594	Energy/Metabolism
1939						
1940	H3060H04	"Mus musculus JNK-binding protein 1 (Jnkbp1-pending), mRNA"		BG081077	Mm.25540	Signal Transduction
1941						
1942	H3060H07	Mm.25580			Mm.25580	Energy/Metabolism
1943						
1944	H3061B06	UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetyl/galactosaminyltransferase 3 (Galnt3), mRNA	Mus musculus UDP-N-acetyl-alpha-D-galactosamine:polypeptide N-acetyl/galactosaminyltransferase 3 (Galnt3), mRNA	BG068045	Mm.38441	Energy/Metabolism
1945						
1946	H3061E04	cysteine dioxygenase, type I (CDO1),	Homo sapiens cysteine dioxygenase, type I (CDO1), mRNA	BG081135	Mm.29996	Energy/Metabolism
1947						
1948	H3061H08	guanine deaminase (Gda),	Mus musculus guanine deaminase (Gda), mRNA	BG081171		Energy/Metabolism
1949						
1950	H3062C04	spermine synthase (Sms),	Mus musculus spermine synthase (Sms), mRNA	BG081202		Energy/Metabolism

1951				Mus musculus isocitrate dehydrogenase mRNA, complete cds	BG081213	Mm.18213	Energy/Metabolism
1952	H3062E02	isocitrate dehydrogenase					
1953		"Mus musculus inositol 1,4,5-					
1954	H3062H07	triphosphate receptor 1 (Ipr1), mRNA"			BG081243	Mm.2726	Signal Transduction
1955							
1956	H3062H08	Mm.11827				Mm.11827	Energy/Metabolism
1957		"Mus musculus calpain 7 (Capn7),					
1958	H3063A03	mRNA"			BG081250	Mm.142370	Signal Transduction
1959				Mus musculus protease, cysteine, 1			
1960	H3063A08	Prsc1		(Prsc1), mRNA	BG068219	Mm.17185	Energy/Metabolism
1961							
1962	H3063A09	"Mus musculus novel ras effector 1			BG068220	Mm.10133	Signal Transduction
1963		(Norel-pending), mRNA"					
1964	H3063C09	beta-1,4-galactosyltransferase VI		Mus musculus beta-1,4-galactosyltransferase VI mRNA, complete cds	BG081279	Mm.26364	Energy/Metabolism
1965				Mus musculus mRNA for LAT2 protein			
1966	H3063H10	LAT2 (Slc7a8)		(Slc7a8 gene)	BG068299	Mm.27830	Energy/Metabolism
1967							
1968	H3064C02	"Mus musculus large tumor suppressor			BG081357	Mm.35642	Signal Transduction
1969		1 (Lats1) mRNA, partial cds"					
1970	H3064C04	kinesin-like 5 (mitotic kinesin-like		Homo sapiens kinesin-like 5 (mitotic			
1971		protein 1) (KNLSL5),		kinesin-like protein 1) (KNLSL5), mRNA			
1972	H3064E02	vacuolar adenosine triphosphatase		Mus musculus vacuolar adenosine			
1973		subunit A gene		triphosphatase subunit A gene, complete	BG081377	Mm.29771	Energy/Metabolism
1974	H3064H04	HMG box protein		Mus musculus HMG box protein			
				mRNA, complete cds		Mm.41766	Transcription/Chromatin

1975 1976	H3065C08	"Mus musculus calmodulin dependent phosphatase catalytic subunit (Cam-Prp) mRNA, 3' end"		BG081448	Mm.24381	Signal Transduction
1977 1978	H3065C11	"Mus musculus Chetk-alpha gene for choline/ethanolamine kinase-alpha, exon 1 and 5'-flanking region"		BG081451		Signal Transduction
1979 1980	H3065D10	"Homo sapiens RAP1A, member of RAS oncogene family (RAP1A), mRNA"		BG068432	Mm.144498	Signal Transduction
1981 1982	H3065E07	UDP-glucose dehydrogenase (Ugdh),	Mus musculus UDP-glucose dehydrogenase (Ugdh), mRNA	BG068439	Mm.10709	Energy/Metabolism
1983 1984	H3066H07	heme oxygenase-2	Mus musculus heme oxygenase-2 mRNA, complete cds	BG081591		Energy/Metabolism
1985 1986	H3067A07	potassium channel modulatory factor DEBT-91 (Debt91),	Mus musculus potassium channel modulatory factor DEBT-91 (Debt91), mRNA	BG081603	Mm.29194	Energy/Metabolism
1987 1988	H3067B08	"Mus musculus phosphoinositide 3-kinase regulatory subunit p85alpha mRNA, complete cds"		BG081616	Mm.3058	Signal Transduction
1989 1990	H3067E02	"Mus musculus RAS-related C3 botulinum substrate 1, guanine nucleotide exchange factor 1 (Racgef1-pending), mRNA"		BG068616	Mm.29014	Signal Transduction
1991 1992	H3068A08	kinesin-like 5 (mitotic kinesin-like protein 1) (KNSL5),	Homo sapiens kinesin-like 5 (mitotic kinesin-like protein 1) (KNSL5), mRNA		Mm.28386	Cell Cycle
1993 1994	H3068A11	ferritin light chain 1 (Ftl1),	Mus musculus ferritin light chain 1 (Ftl1), mRNA	BG081695		Energy/Metabolism

1995		ornithine decarboxylase antizyme inhibitor (Oazi), mRNA	Mus musculus ornithine decarboxylase antizyme inhibitor (Oazi), mRNA	BG081746	Mm.104010	Energy/Metabolism
1996	H3068F03					
1997		"Mus musculus Rho-associated coiled-coil forming kinase 1 (Rock1), mRNA"				
1998	H3069C09			BG081800	Mm.6710	Signal Transduction
1999		cDNA FLJ12814 fis, clone NT2RP2002520, weakly similar to Homo sapiens transcription factor RFX-B (RFXB)	Homo sapiens cDNA FLJ12814 fis, clone NT2RP2002520, weakly similar to Homo sapiens transcription factor RFX-B (RFXB) mRNA	BG081823	Mm.27228	Energy/Metabolism
2000	H3069D09					
2001		choline/ethanolaminephosphotransferase (CEPT1), mRNA	Homo sapiens choline/ethanolaminephosphotransferase (CEPT1), mRNA	BG081849	Mm.14816	Energy/Metabolism
2002	H3069G01					
2003		RHOA proto-oncogene multi-drug-resistance protein , 3 end	Homo sapiens RHOA proto-oncogene multi-drug-resistance protein mRNA, 3 end	BG081880	Mm.757	Energy/Metabolism
2004	H3070A09					
2005		quinoid dihydropteridine reductase (QDPR), mRNA	Homo sapiens quinoid dihydropteridine reductase (QDPR), mRNA	BG081883	Mm.30204	Energy/Metabolism
2006	H3070A12					
2007		partial Kcnq1 gene potassium channel protein, exons 10-14	Mus musculus partial Kcnq1 gene for potassium channel protein, exons 10-14	BG081892		Energy/Metabolism
2008	H3070B09					
2009		hydroxysteroid dehydrogenase-1, delta<5>-3-beta (Hsd3b1), mRNA	Mus musculus hydroxysteroid dehydrogenase-1, delta<5>-3-beta (Hsd3b1), mRNA	BG081903	Mm.16941	Energy/Metabolism
2010	H3070C08					
2011		ATP-specific succinyl-CoA synthetase beta subunit (Scs), partial cds	Mus musculus ATP-specific succinyl-CoA synthetase beta subunit (Scs) mRNA, partial cds	BG068897	Mm.19154	Energy/Metabolism
2012	H3070E04					
2013		ATPase, class VI, type 11A (Atp11a), mRNA	Mus musculus ATPase, class VI, type 11A (Atp11a), mRNA	BG081967	Mm.148756	Energy/Metabolism
2014	H3071A03					

2015	H3071G11	"Homo sapiens RAP2B, member of RAS oncogene family (RAP2B), mRNA"		BG082041	Mm.26939	Signal Transduction
2016						
2017	H3071H04	glycerol-3-phosphate acyltransferase	Mouse glycerol-3-phosphate acyltransferase mRNA, complete cds		Mm.87773	
2018						
2019	H3072A08	glyceraldehyde-3-phosphate dehydrogenase (Gapd)	Mus musculus glyceraldehyde-3-phosphate dehydrogenase (Gapd), mRNA	BG082061		Energy/Metabolism
2020						
2021	H3072B11	"Mus musculus PLC-L2 mRNA for phospholipase C-L2, complete cds"		BG069051	Mm.28034	Signal Transduction
2022						
2023	H3072F03	Mm.22651			Mm.22651	Energy/Metabolism
2024						
2025	H3072G09	potassium voltage-gated channel, subfamily H (eag-related), member 1 (Kcch1), mRNA	Mus musculus potassium voltage-gated channel, subfamily H (eag-related), member 1 (Kcch1), mRNA	BG069106	Mm.4489	Energy/Metabolism
2026						
2027	H3073F09	Mm.27123			Mm.27123	Energy/Metabolism
2028						
2029	H3073F10	"Mus musculus 80kDa m-calpain subunit (calp80) mRNA, complete cds"		BG082209	Mm.6958	Signal Transduction
2030						
2031	H3073G07	granzyme M	Mus musculus mRNA for granzyme M, complete cds	BG082217	Mm.22302	Energy/Metabolism
2032						
2033	H3074A02	inhibitor of apoptosis protein 1	Mus musculus inhibitor of apoptosis protein 1 mRNA, complete cds	BG069214	Mm.2026	Apoptosis
2034						
2035	H3074A03	NIMA (never in mitosis gene a)-related expressed kinase 7 (Nek7),	Mus musculus NIMA (never in mitosis gene a)-related expressed kinase 7 (Nek7), mRNA		Mm.143817	Cell Cycle
2036						
2037	H3074C12	dUTPase	Mus musculus dUTPase mRNA, complete cds	BG082266		Energy/Metabolism

2038			"Mus musculus protein phosphatase type 2A catalytic subunit alpha isoform mRNA, complete cds"							
2039	H3074F08							BG082298	Mm.11711	Signal Transduction
2040			H.sapiens 40 kDa protein kinase related to rat ERK2				H.sapiens 40 kDa protein kinase related to rat ERK2		Mm.1700	
2041	H3074G02						Homo sapiens mRNA for NAALADase II protein	BG082322	Mm.26132	Energy/Metabolism
2042									Mm.26128	Energy/Metabolism
2043	H3074H09		NAALADase II protein							
2044										
2045	H3075A04		Mm.26128							
2046			esterase-22=endoplasmic reticulum-targeting protein of beta-glucuronidase				esterase-22=endoplasmic reticulum-targeting protein of beta-glucuronidase			
2047	H3075A09		[mice, , 2022 nt]				[mice, mRNA, 2022 nt]	BG069315	Mm.29110	Energy/Metabolism
2048			ATP-specific succinyl-CoA synthetase beta subunit (Scs) , partial cds				Mus musculus ATP-specific succinyl-CoA synthetase beta subunit (Scs) mRNA, partial cds	BG069442	Mm.19154	Energy/Metabolism
2049	H3075F01									
2050			F1F0-ATP synthase, g subunit				Mus musculus mRNA for F1F0-ATP synthase, g subunit	BG082389	Mm.14663	Energy/Metabolism
2051	H3075F08									
2052			"Mus musculus heat shock protein 20-like protein mRNA, complete cds"					BG069463	Mm.21549	Heat Shock/Stress
2053	H3075F11									
2054			molybdenum cofactor synthesis-step 1 proteins A and B splice type I (Mocs1) s, partial cds, alternatively spliced				Mus musculus molybdenum cofactor synthesis-step 1 proteins A and B splice type I (Mocs1) mRNAs, partial cds, alternatively spliced	BG082399	Mm.36112	Energy/Metabolism
2055	H3075G06									
2056			peptidyl arginine deiminase, type II				Mus musculus peptidyl arginine deiminase, type II (Pdi2), mRNA	BG082407	Mm.2296	Energy/Metabolism
2057	H3075H02		(Pdi2),							
2058			"Mus musculus Rho interacting protein							
2059	H3076B05		2 (Rhoip2-pending), mRNA"					BG069493	Mm.4620	Signal Transduction

2060								
2061	H3076C12	fatty-acid-Coenzyme A ligase, long-chain 4 (FACL4),	Homo sapiens fatty-acid-Coenzyme A ligase, long-chain 4 (FACL4), mRNA	BG069344	Mm.12166	Energy/Metabolism		
2062		"AC005290, complete sequence [Mus musculus]"		BG069372	Mm.1967	Signal Transduction		
2063	H3076F04	"Homo sapiens regulator of G protein signaling RGS12 (RGS) mRNA, complete cds"						
2064				BG082484	Mm.31378	Signal Transduction		
2065	H3076F12							
		"Mus musculus signal transducer and activator of transcription 2 (Stat2), mRNA"		BG069385	Mm.21935	Signal Transduction		
2066	H3076G06							
2067			Homo sapiens similar to argininosuccinate lyase (H. sapiens) (LOC63402), mRNA	BG082495	Mm.23869	Energy/Metabolism		
2068		similar to argininosuccinate lyase (H. sapiens) (LOC63402),						
2069	H3076G11	"Mus musculus adenylylate kinase 4 (Ak4), mRNA"		BG082501	Mm.142051	Signal Transduction		
2070	H3076H06							
2071		"Mus musculus casein kinase II, alpha 2, polypeptide (Csnk2a2), mRNA"		BG069401	Mm.28881	Signal Transduction		
2072	H3076H10							
2073		solute carrier family 12, member 2 (Slc12a2),	Mus musculus solute carrier family 12, member 2 (Slc12a2), mRNA	BG069505	Mm.4168	Energy/Metabolism		
2074	H3077B02							
2075		X28 region near ALD locus containing dual specificity phosphatase 9 (DUSP9), ribosomal protein L18a (RPL18a), Ca2+/Calmodulin-dependent protein kinase I (CAMKI), creatine transporter (Homo sapiens X28 region near ALD locus containing dual specificity phosphatase 9 (DUSP9), ribosomal protein L18a (RPL18a), Ca2+/Calmodulin-dependent protein kinase I (CAMKI), creatine transporter (BG069516	Mm.28056	Energy/Metabolism		
2076								
2077	H3077C01							

2078	H3077F08	ATPase, H(+)-transporting, lysosomal, noncatalytic accessory protein 1B (ATP6N1B), mRNA	Homo sapiens ATPase, H(+)-transporting, lysosomal, noncatalytic accessory protein 1B (ATP6N1B), mRNA	BG082574	Mm.26909	Energy/Metabolism
2080	H3077H01	hypothetical protein FLJ10726	Homo sapiens hypothetical protein FLJ10726 (FLJ10726), mRNA		Mm.30718	
2082	H3078G02	NIMA (never in mitosis gene a)-related expressed kinase 7 (Nek7), mRNA	Mus musculus NIMA (never in mitosis gene a)-related expressed kinase 7 (Nek7), mRNA			
2084	H3078H09	Rat L-gulonono-gamma-lactone oxidase	Rat L-gulonono-gamma-lactone oxidase mRNA, complete cds	BG082674	Mm.26207	Energy/Metabolism
2086	H3078H11	TRPM-2, cytosolic epoxide hydrolase, nicotinic acetylcholine receptor alpha2 subunit, and focal adhesion kinase genes, sequence	Homo sapiens TRPM-2, cytosolic epoxide hydrolase, nicotinic acetylcholine receptor alpha2 subunit, and focal adhesion kinase genes, complete cds, complete sequence	BG082676	Mm.26207	Energy/Metabolism
2088	H3079D11	solute carrier family 12, member 2 (Slc12a2), mRNA	Mus musculus solute carrier family 12, member 2 (Slc12a2), mRNA	BG069726	Mm.4168	Energy/Metabolism
2090	H3079D12	"Mus musculus phospholipase D3 (Plid3), mRNA"		BG069727	Mm.6483	Signal Transduction
2092	H3079E06	"Mus musculus interferon regulatory factor 6 (Irf6), mRNA"		BG069733	Mm.4179	Heat Shock/Stress
2094	H3079F01	cDNA: FLJ22083 fis, clone HEP14459, highly similar to HUM3H3M 3-hydroxy-3-methylglutaryl coenzyme A synthase	Homo sapiens cDNA: FLJ22083 fis, clone HEP14459, highly similar to HUM3H3M Homo sapiens 3-hydroxy-3-methylglutaryl coenzyme A synthase mRNA	BG069739	Mm.22675	Energy/Metabolism

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2118	H3081D02	Bcl-2-related ovarian killer protein-like-pending (Bokl-pending),	Mus musculus Bcl-2-related ovarian killer protein-like-pending (Bokl-pending), mRNA	BG082842	Mm.3295	Apoptosis
2119						
2120	H3081E08	TNF-alpha converting enzyme precursor, , alternatively spliced	Mus musculus TNF-alpha converting enzyme precursor, mRNA, alternatively spliced, complete cds	BG082857	Mm.27681	Apoptosis
2121						
2122	H3081H02	aldo-keto reductase AKR1C13	Mus musculus aldo-keto reductase AKR1C13 (Akr1c13), mRNA	BG082884	Mm.27447	Energy/Metabolism
2123						
2124	H3082B04	Mus musculus inducible 6-phosphofructo-2-kinase mRNA, complete cds		BG070045	Mm.19669	Energy/Metabolism
2125						
2126	H3082C01	Mus musculus serine protease inhibitor 1-5 (Spi1-5), mRNA		BG070053	Mm.89871	Energy/Metabolism
2127						
2128	H3082E03	Mus musculus programmed cell death 8 (apoptosis inducing factor) (Pdcd8), mRNA		BG082930	Mm.30050	Apoptosis
2129						
2130	H3082E10	H.sapiens mitogen inducible gene mig-2, complete CDS			Mm.29842	Signal Transduction
2131						
2132	H3082F03	M.musculus (balb-c) gene for sphingomyelin phosphodiesterase		BG082939	Mm.4628	Energy/Metabolism
2133						
2134	H3083C01	Homo sapiens kinesin-like 5 (mitotic kinesin-like protein 1) (KNLSL5), mRNA			Mm.28386	Cell Cycle
2135						
2136	H3083D06	Mus musculus Bcl2-associated athanogene 1 (Bag1), mRNA		BG069990	Mm.688	Apoptosis
2137						
2138	H3083D09	Homo sapiens cDNA FLJ14310 fis, clone PLACE3000271				
2139				BG069993	Mm.7156	Energy/Metabolism

2140	H3083E02	"Mus musculus beta-site APP cleaving enzyme (Bace), mRNA"		BG069998	Mm.24044	Signal Transduction
2141						
2142	H3083H02	"Mus musculus guanine nucleotide binding protein, beta-2, related sequence 1 (Gnb2-rs1), mRNA"		BG070116	Mm.5305	Signal Transduction
2143						
2144	H3083H05	Mus musculus mRNA for tumor necrosis factor alpha converting enzyme 1 (TACE/ADAM17), complete cds		BG070119	Mm.27681	Energy/Metabolism
2145						
2146	H3084E05	glutathione S-transferase, mu 5 (Gstm5), mRNA	Mus musculus glutathione S-transferase, mu 5 (Gstm5), mRNA	BG070174	Mm.667	Energy/Metabolism
2147						
2148	H3084F02	Mm.24864			Mm.24864	Energy/Metabolism
2149						
2150	H3084G03	Mouse c-fos gene; cellular homolog to viral oncogene		BG070196	Mm.5043	Signal Transduction
2151						
2152	H3085B01	M. musculus mRNA for casein kinase I-alpha		BG083155	Mm.43737	Signal Transduction
2153						
2154	H3085C02	Mus musculus Traf and Tnf receptor associated protein (Trap-pending), mRNA		BG070243	Mm.155228	Apoptosis
2155						
2156	H3085C04	Mus musculus solute carrier family 12, member 2 (Slc12a2), mRNA		BG070245	Mm.4168	Energy/Metabolism
2157						
2158	H3085D10	Mus musculus guanine deaminase (Gda), mRNA		BG083182	Mm.25912	Energy/Metabolism
2159						
2160	H3085G03	Mouse cytochrome beta-558 mRNA, 3' end		BG083209	Mm.448	Energy/Metabolism
2161						
2162	H3086E09	Homo sapiens BCL2-associated athanogene 5 (BAG5), mRNA		BG070363	Mm.44239	Apoptosis

2163									
2164	H3086F10	B.taurus Cl-SGDH mRNA for ubiquinone oxidoreductase complex				BG083295	Mm.28058		Energy/Metabolism
2165		"Mus musculus mRNA for Rho guanine nucleotide-exchange factor, splice variant NET1A"							
2166	H3086H09					BG083317	Mm.22261		Signal Transduction
2167									
2168	H3087A12	uterine lactotransferrin			Mouse uterine lactotransferrin mRNA	BG070413	Mm.7612		Energy/Metabolism
2169									
2170	H3087C10	"Mus musculus rho GTPase activating protein 6 (Arhgap6), mRNA"				BG083351			Signal Transduction
2171									
2172	H3087G09	"Mus musculus heat shock protein 930 (Hsp930), mRNA"				BG070480	Mm.104491		Heat Shock/Stress
2173									
2174	H3087H05	acetoacetyl-coenzyme A thiolase (EC 2.3.1.9)			Human mRNA for acetoacetyl- coenzyme A thiolase (EC 2.3.1.9)	BG083405	Mm.1776		Energy/Metabolism
2175									
2176	H3087H09	"Mus musculus calcium binding protein A6 (calcyclin) (S100a6), mRNA"				BG083409	Mm.1221		Signal Transduction
2177									
2178	H3088A07	glutathione S-transferase, mu 2 (Gstm2), mRNA			Mus musculus glutathione S-transferase, mu 2 (Gstm2), mRNA	BG070501	Mm.7446		Energy/Metabolism
2179									
2180	H3088C12	CPP32 apoptotic protease, partial cds			Mus musculus CPP32 apoptotic protease mRNA, partial cds	BG083524	Mm.153450		Apoptosis
2181									
2182	H3088E07	"Mus musculus choline kinase (Chk), mRNA"				BG070547	Mm.5262		Signal Transduction
2183									
2184	H3088F03	"Mus musculus protein tyrosine phosphatase 4a3 (Ptp4a3), mRNA"				BG083549	Mm.4124		Signal Transduction

2185	H3089A06	Mus musculus ATPase, H ⁺ transporting, lysosomal (vacuolar proton pump), beta 56/58 kDa, isoform 2 (Atp6b2), mRNA		BG083588	Mm.10727	Energy/Metabolism
2186						
2187	H3089A11	Mus musculus ATP-binding cassette protein (Abcf2) mRNA, partial cds		BG083593	Mm.21629	Energy/Metabolism
2188						
2189	H3089F09	"Mus musculus protein kinase Chk2 (Rad53-pending), mRNA"		BG083482	Mm.126031	Signal Transduction
2190						
2191	H3089G12	Mus musculus zinc transporter like 1 (Znt1) mRNA, complete cds		BG083497	Mm.28851	Energy/Metabolism
2192						
2193	H3089H11	Mouse normal c-myc gene and translocated homologue from J558 plasmocytoma cells (cDNA sequence)		BG083596	Mm.2444	Signal Transduction
2194						
2195	H3090B01	"Mus musculus mothers-against-dpp-related-1 mRNA, complete cds"		BG083610	Mm.15185	Signal Transduction
2196						
2197	H3090B05	uracil-DNA glycosylase gene, alternatively spliced	Mus musculus uracil-DNA glycosylase gene, complete cds, alternatively spliced	BG070697	Mm.112312	Energy/Metabolism
2198						
2199	H3090C08	ornithine decarboxylase antizyme inhibitor (Oazi),	Mus musculus ornithine decarboxylase antizyme inhibitor (Oazi), mRNA	BG070710	Mm.6775	Energy/Metabolism
2200						
2201	H3090C10	N-terminal asparagine amidohydrolase (Ntan1) gene	Mus musculus N-terminal asparagine amidohydrolase (Ntan1) gene, complete cds	BG083629	Mm.22635	Energy/Metabolism
2202						

2203		"Mus musculus mitogen activated protein kinase kinase 12"					
2204	H3090D01	(Map3k12), mRNA"			BG083632	Mm.4358	Signal Transduction
2205		partial gene encoding					
2206	H3091B08	deoxyribonuclease I and 5 UTR		Mus musculus partial gene encoding deoxyribonuclease I and 5 UTR	BG070787	Mm.42205	Energy/Metabolism
2207		"Mus musculus guanine nucleotide binding protein, alpha 14 (Gna14), mRNA"					
2208	H3091D08				BG083726	Mm.133949	Signal Transduction
2209		tumor necrosis factor (ligand) superfamily, member 19 (Tnfrsf19- pending),		Mus musculus tumor necrosis factor (ligand) superfamily, member 19 (Tnfrsf19- pending), mRNA			
2210	H3091D11				BG070891	Mm.22585	Apoptosis
2211		5(3)-deoxyribonucleotidase (Dnt- pending),		Mus musculus 5(3)- deoxyribonucleotidase (Dnt- pending), mRNA			
2212	H3091E02				BG070894	Mm.41722	Energy/Metabolism
2213		N-terminal Asn amidase (Ntan1),		Mus musculus N-terminal Asn amidase (Ntan1), mRNA			
2214	H3091F08				BG070912	Mm.22635	Energy/Metabolism
2215		solute carrier family 1, member 7		Mus musculus solute carrier family 1, member 7 (Slc1a7), mRNA			
2216	H3091G12	(Slc1a7),			BG070928	Mm.1056	Energy/Metabolism
2217		"Mus musculus H-ras gene, partial cds"					
2218	H3091H05				BG070933	Mm.6793	Signal Transduction
2219		deiodinase, iodothyronine type III		Rattus norvegicus deiodinase, iodothyronine type III (Dio3), mRNA			
2220	H3091H07	(Dio3),			BG070934	Mm.154427	Energy/Metabolism
2221		Balb/c cytochrome c oxidase subunit		Mus musculus Balb/c cytochrome c oxidase subunit VtaL mRNA, complete cds			
2222	H3092E03	VtaL			BG083822	Mm.43415	Energy/Metabolism
2223		caspase 8 associated protein 2		Mus musculus caspase 8 associated protein 2 (Casp8ap2), mRNA			
2224	H3092E04	(Casp8ap2),			BG070820	Mm.22279	Apoptosis

2225	H3092G01	"Mus musculus p38delta MAP kinase mRNA, complete cds"			BG083840	Mm.27970	Signal Transduction
2226							
2227	H3092H01	Mus musculus vacuolar adenosine triphosphatase subunit A gene, complete cds			BG070846	Mm.29771	Energy/Metabolism
2228							
2229							
2230	H3092H09	"Mus musculus mitogen-activated protein kinase 8 interacting protein 2 (Mapk8ip2), mRNA"			BG083857		Signal Transduction
2231							
2232	H3092H10	glycogenin 1 (Gyg1), mRNA	Mus musculus glycogenin 1 (Gyg1), mRNA		BG070855	Mm.6375	Energy/Metabolism
2233							
2234	H3093B07	chloride channel 5 (Clcn5), mRNA	Mus musculus chloride channel 5 (Clcn5), mRNA		BG083875	Mm.104172	Energy/Metabolism
2235							
2236	H3093D09	Tom22	Homo sapiens mRNA for Tom22, complete cds		BG083900	Mm.9326	Energy/Metabolism
2237							
2238	H3093F02	uridine monophosphate kinase (UMPK), mRNA	Homo sapiens uridine monophosphate kinase (UMPK), mRNA		BG083915		Energy/Metabolism
2239							
2240	H3093G07	"Homo sapiens Putative prostate cancer tumor suppressor (N33), mRNA"			BG071015	Mm.24156	Signal Transduction
2241							
2242	H3093G08	GST-5=glutathione S-transferase-sperm antigen MSAg-5 fusion protein {3 region} [mice, testis, Recombinant Partial, 860 nt]	GST-5=glutathione S-transferase-sperm antigen MSAg-5 fusion protein {3 region} [mice, testis, mRNA Recombinant Partial, 860 nt]		BG071016	Mm.11346	Energy/Metabolism
2243							
2244	H3093H01	mannosyl (alpha-1,6-)-glycoprotein beta-1,2-N-acetylglucosaminyltransferase (MGAT2), mRNA	Homo sapiens mannosyl (alpha-1,6-)-glycoprotein beta-1,2-N-acetylglucosaminyltransferase (MGAT2), mRNA		BG084016	Mm.24293	Energy/Metabolism

2245		Mus musculus gene for prostacyclin synthase, 5-flanking region and partial cds			BG084049		Energy/Metabolism
2246	H3094C01						
2247		Mus musculus cytochrome P450 side chain cleavage enzyme 11a1					
2248	H3094D01	(Cyp11a1), mRNA			BG071067	Mm.108678	Energy/Metabolism
2249		"Mus musculus GNB1 gene for G protein beta1 subunit, exon 12 and complete cds"					
2250	H3094D02				BG071068	Mm.2344	Signal Transduction
2251		Mus musculus GLUT4 vesicle protein					
2252	H3094D04	mRNA, partial cds			BG071070	Mm.29010	Energy/Metabolism
2253							
2254	H3094E12		-			Mm.26092	Energy/Metabolism
2255		Homo sapiens cDNA FLJ12225 fis, clone MAMMA1001139, weakly					
2256	H3094G04	similar to SRE-2 PROTEIN			BG083967	Mm.12983	Energy/Metabolism
2257		Homo sapiens mitogen-activated protein kinase kinase kinase 3					
2258	H3094G10	(MAP4K3), mRNA				Mm.29588	
2259		Mus musculus Bcl2-interacting killer-					
2260	H3094H06	like (Biklk), mRNA			BG071119	Mm.17912	Apoptosis
2261		Mus musculus mitogen activated protein kinase kinase kinase 12 (Map3k12),					
2262	H3095D11	mRNA					
2263		Mus musculus glutathione S-transferase					
	H3095E06	like (Gstl-pending), mRNA			BG084006	Mm.282	Energy/Metabolism

2264	H3095F10	Homo sapiens calcineurin binding protein 1 (KIA0330), mRNA			BG071186	Mm.154496	
2265							
2266	H3095G051	Rattus norvegicus Fucosidase, alpha-L-1, tissue (Fuca), mRNA			BG084074	Mm.21580	Energy/Metabolism
2267							
2268	H3095H12	Mus musculus carbonic anhydrase 4 (Car4), mRNA			BG071207	Mm.1641	Energy/Metabolism
2269							
2270	H3096A03	cytochrome c oxidase, subunit IV (Cox4),	Mus musculus cytochrome c oxidase, subunit IV (Cox4), mRNA		BG084085	Mm.2136	Energy/Metabolism
2271							
2272	H3096D01	"Mus musculus protein phosphatase 4, catalytic subunit (Ppp4c), mRNA"			BG071232	Mm.28082	Signal Transduction
2273							
2274	H3096E12	clone TSIP1 p53-induced apoptosis differentially expressed sequence	Mus musculus clone TSIP1 p53-induced apoptosis differentially expressed mRNA sequence		BG084126	Mm.142872	Apoptosis
2275							
2276	H3096F11	HNK-1 sulfotransferase (HNK-1ST),	Homo sapiens HNK-1 sulfotransferase (HNK-1ST), mRNA		BG084134	Mm.26817	Energy/Metabolism
2277							
2278	H3097A02	Homo sapiens leucine aminopeptidase (LOC51056), mRNA			BG084150	Mm.34832	Energy/Metabolism
2279							
2280	H3097A03	Mus musculus cytochrome c oxidase, subunit IV (Cox4), mRNA			BG084151	Mm.2136	Energy/Metabolism
2281							
2282	H3097A05	Homo sapiens sulfite oxidase (SUOX), mRNA			BG084153	Mm.23352	Energy/Metabolism
2283							
2284	H3097B01	Mus musculus branched chain aminotransferase 1, cytosolic (Bcat1), mRNA			BG084158	Mm.4606	Energy/Metabolism

2285		Mus musculus solute carrier family 11 (proton-coupled divalent metal ion transporters), member 2 (Slc11a2), mRNA					
2286	H3097B03				BG084160	Mm.36460	Energy/Metabolism
2287							
2288	H3097C12					Mm.22409	Energy/Metabolism
2289							
2290	H3097F02	Mus musculus sialyltransferase 8 (alpha-2, 8-sialyltransferase) B (Siat8b), mRNA			BG084201	Mm.4954	Energy/Metabolism
2291							
2292	H3097F06	Homo sapiens FACL5 for fatty acid coenzyme A ligase 5 (LOC51703), mRNA			BG084205	Mm.30263	Energy/Metabolism
2293							
2294	H3097G07	"Mus musculus retinoblastoma-binding protein 9 (Rbbp9), mRNA"			BG084218	Mm.24216	Signal Transduction
2295							
2296	H3097H08	"Mus musculus retinoblastoma binding protein 4 (Rbbp4), mRNA"			BG084231	Mm.12145	Signal Transduction
2297							
2298	H3098A08	B.taurus PSST subunit of the NADH: ubiquinone oxidoreductase complex	B.taurus mRNA for PSST subunit of the NADH: ubiquinone oxidoreductase complex		BG084240	Mm.28712	Energy/Metabolism
2299							
2300	H3098D02	"Mus musculus protein tyrosine phosphatase, receptor-type, F interacting protein, binding protein 2 (Ppfibp2), mRNA"			BG084265	Mm.2817	Signal Transduction
2301							
2302	H3098D12	"Mus musculus mitogen activated protein kinase kinase 1 (Map2k1), mRNA"			AU041108	Mm.1059	Signal Transduction

2303	H3098E11	"Mus musculus chaperonin subunit 2 (beta) (Cct2), mRNA"			BG084277	Mm.40849	Heat Shock/Stress
2304							
2305	H3098H02	carboxyl reductase (LOC51181),	Homo sapiens carbonyl reductase (LOC51181), mRNA		BG084296		Energy/Metabolism
2306							
2307	H3099A05	5-nucleotidase (purine), cytosolic type B (NT5B),	Homo sapiens 5-nucleotidase (purine), cytosolic type B (NT5B), mRNA		BG084308	Mm.29601	Energy/Metabolism
2308							
2309		solute carrier family 34 (sodium	Mus musculus solute carrier family 34 (sodium phosphate), member 2 (Slc34a2), mRNA		BG084323		Energy/Metabolism
2310	H3099C01	phosphate), member 2 (Slc34a2),					
2311							
2312	H3099D04	cytochrome c oxidase Vb subunit gene	Mouse cytochrome c oxidase Vb subunit gene, complete cds		BG071472	Mm.16769	Energy/Metabolism
2313							
2314	H3099E08	cDNA FLJ13488 fis, clone PLACE1003915, weakly similar to PROBABLE ARGINYL-TRNA SYNTHETASE, CYTOPLASMIC (EC 6.1.1.19)	Homo sapiens cDNA FLJ13488 fis, clone PLACE1003915, weakly similar to PROBABLE ARGINYL-TRNA SYNTHETASE, CYTOPLASMIC (EC 6.1.1.19)		BG084341	Mm.22363	
2315							
2316	H3100C01	rod cGMP phosphodiesterase delta subunit (Pde6d) gene	Mus musculus rod cGMP phosphodiesterase delta subunit (Pde6d) gene, complete cds		BG084383	Mm.12925	Energy/Metabolism
2317							
2318	H3100C10	potassium intermediate/small conductance calcium-activated channel, subfamily N, member 2 (KCNN2),	Homo sapiens potassium intermediate/small conductance calcium-activated channel, subfamily N, member 2 (KCNN2), mRNA		BG084391	Mm.17734	Energy/Metabolism
2319							
2320	H3100E04	inhibitor of apoptosis protein 1	Mus musculus inhibitor of apoptosis protein 1 mRNA, complete cds		BG084405	Mm.2026	Apoptosis
2321							
2322	H3101A08	ribosomal protein L23 (RpL23),	Mus musculus ribosomal protein L23 (RpL23), mRNA		BG084450	Mm.12144	Energy/Metabolism

2323		glyceraldehyde-3-phosphate	Mus musculus glyceraldehyde-3-phosphate dehydrogenase (Gapd), mRNA	BG071626	Mm.5289	Energy/Metabolism
2324	H3101C10	dehydrogenase (Gapd),				
2325		phosphatidylethanolamine N-	Mus musculus phosphatidylethanolamine N-methyltransferase (Pemt), mRNA	BG071633	Mm.2731	Energy/Metabolism
2326	H3101D05	methyltransferase (Pemt),				
2327		solute carrier family 34 (sodium	Mus musculus solute carrier family 34 (sodium phosphate), member 2 (Slc34a2), mRNA	BG071644	Mm.3786	Energy/Metabolism
2328	H3101E05	phosphate), member 2 (Slc34a2),				
2329	H3101G05	"Mus musculus DNA J protein (Dnaj3), mRNA"		AU044106	Mm.29186	Heat Shock/Stress
2330		"Rattus norvegicus myotonic dystrophy				
2331	H3101H02	kinase-related Cdc42-binding kinase (MRCK) mRNA, complete cds"		BG071671	Mm.38330	Signal Transduction
2332			Mus musculus phosphatidylserine synthase 1 (Ptss1), mRNA	BG071685	Mm.9440	Energy/Metabolism
2333	H3102A07	phosphatidylserine synthase 1 (Ptss1),				
2334			Rattus norvegicus choline transporter (CHOT1), mRNA	BG071707	Mm.28056	Energy/Metabolism
2335	H3102C06	choline transporter (CHOT1),				
2336		apoptotic chromatin condensation	Mus musculus apoptotic chromatin condensation inducer in the nucleus (Acinus-pending), mRNA	BG071714	Mm.30236	Apoptosis
2337	H3102D02	inducer in the nucleus (Acinus-pending),				
2338		"Mus musculus retinoblastoma binding				
2339	H3102D09	protein 7 (Rbbp7), mRNA"		BG084566	Mm.1603	Signal Transduction
2340			Mus musculus potassium channel modulatory factor DEBT-91 (Debt91), mRNA	BG071725	Mm.29194	Energy/Metabolism
2341	H3102E01	potassium channel modulatory factor				

2342	H3102F08	N-acylsphingosine amidohydrolase 1 (Asah1),	Mus musculus N-acylsphingosine amidohydrolase 1 (Asah1), mRNA	BG071742	Mm.22547	Energy/Metabolism
2343		"Mus musculus protein tyrosine phosphatase, non-receptor type 11 (Ptprn11), mRNA"				
2344	H3102G07		Homo sapiens isoleucine-tRNA synthetase (IARS), mRNA	BG071749	Mm.147428	Signal Transduction
2345				BG084601	Mm.21118	Energy/Metabolism
2346	H3102H03	isoleucine-tRNA synthetase (IARS),				
2347			Mus musculus 2,3-bisphosphoglycerate mutase (Bpgm), mRNA	BG084605	Mm.22706	Energy/Metabolism
2348	H3102H07	2,3-bisphosphoglycerate mutase				
2349			Mus musculus ribonuclease H1 (Rnaseh1), mRNA	BG071762	Mm.10152	Energy/Metabolism
2350	H3102H09	ribonuclease H1 (Rnaseh1),				
2351						
2352	H3103A05	"Mus musculus phospholipase A2, group 4 (Pla2g4), mRNA"		BG084614	Mm.4186	Signal Transduction
2353						
2354		Mus musculus BCL2/adenovirus E1B 19 kDa-interacting protein 3-like				
2355	H3103B07	(Bnip3l), mRNA		BG084628	Mm.142818	Apoptosis
2356		"Mus musculus protein phosphatase 1, catalytic subunit, gamma isoform				
2357	H3103D01	(Ppp1cc), mRNA"		BG071790	Mm.7793	Signal Transduction
2358						
2359	H3103D11	"Mus musculus regulator of G-protein signaling 17 (Rgs17), mRNA"		BG071811	Mm.44606	Signal Transduction
2360						
2361	H3103E12	Mus musculus Bcl2-like 10 (Bcl2l10), mRNA		BG071824	Mm.25988	Apoptosis
2362						
2363	H3103F06	"Mus musculus small GTPase (Rab11a) gene, complete cds"		BG071829	Mm.1387	Signal Transduction

2364	H3104A11	Mus musculus thioredoxin-like (32kD) (Txn1), mRNA		BG071869	Mm.19169	Energy/Metabolism
2365						
2366	H3104D01	Mouse mRNA for beta-1,4-galactosyltransferase		BG071892	Mm.15622	Energy/Metabolism
2367						
2368	H3104E06	Mus musculus ATP-binding cassette protein (Abcc1b) mRNA, partial cds		BG071908	Mm.41002	Energy/Metabolism
2369						
2370	H3105A09	Pseudomonas aeruginosa PA01, section 341 of 529 of the genome	Pseudomonas aeruginosa PA01, section 341 of 529 of the complete genome	BG071952		Energy/Metabolism
2371						
2372	H3105A10	cDNA FLJ12989 fis, clone NT2RP3000085, moderately similar to ACETYL-PROPIONYL-COENZYME A CARBOXYLASE ALPHA CHAIN [CONTAINS: BIOTIN CARBOXYLASE (EC 6.3.4.14); BIOTIN CARBOXYL CARRIER	Homo sapiens cDNA FLJ12989 fis, clone NT2RP3000085, moderately similar to ACETYL-PROPIONYL-COENZYME A CARBOXYLASE ALPHA CHAIN [CONTAINS: BIOTIN CARBOXYLASE (EC 6.3.4.14); BIOTIN CARBOXYL CARRIER	BG084872	Mm.154589	Energy/Metabolism
2373						
2374	H3105B07	"Mus musculus Cctz-2 gene for chaperonin containing TCP-1 zeta-2 subunit, exon 1, 2, 3"		BG084881	Mm.29622	Heat Shock/Stress
2375						
2376	H3105C03	CGI-30 protein (LOC51611),	Homo sapiens CGI-30 protein (LOC51611), mRNA	BG084888	Mm.5915	Energy/Metabolism
2377						
2378	H3105C04	natural killer cell BY55 precursor (By55-pending),	Mus musculus natural killer cell BY55 precursor (By55-pending), mRNA	BG084889	Mm.11526	Apoptosis
2379						
2380	H3105C10	"Mus musculus mRNA for LIMK2b, complete cds"		BG071976	Mm.42927	Signal Transduction
2381						
2382	H3105D09	mus apoptosis-associated speck-like protein containing CARD	Mus musculus musc mRNA for apoptosis-associated speck-like protein containing CARD, complete cds	BG071986	Mm.24163	Apoptosis
2383						

2384			tyrosine 3-monooxygenase/tryptophan	Mus musculus tyrosine 3-				
2385	H3105E08		5-monooxygenase activation protein, theta polypeptide (Ywhaq), mRNA	monooxygenase/tryptophan 5- monooxygenase activation protein, theta polypeptide (Ywhaq), mRNA	BG084914	Mm.14722	Energy/Metabolism	
2386			"Mus musculus mitogen-activated protein kinase kinase kinase 4					
2387	H3105G04		(Map4k4), mRNA"		BG084932	Mm.987	Signal Transduction	
2388			pyrroline 5-carboxylate reductase isom	Homo sapiens pyrroline 5-carboxylate				
2389	H3105G10		(P5CR2),	reductase isoform (P5CR2), mRNA	BG072021	Mm.29379	Energy/Metabolism	
2390							Energy/Metabolism	
2391	H3107D11		H3107D11				Energy/Metabolism	
2392								
2393	H3107E03		H3107E03					
2394			alpha-N-acetylglucosaminidase	Mus musculus alpha-N-				
2395	H3107G10		(Sanfilippo disease IIB) (Naglu),	acetylglucosaminidase (Sanfilippo disease IIB) (Naglu), mRNA	BG072192	Mm.6142	Energy/Metabolism	
2396								
2397	H3107G12		camitine octanoyltransferase (COT),	Homo sapiens carnitine	BG085029	Mm.28197	Energy/Metabolism	
2398				octanoyltransferase (COT), mRNA				
2399	H3108C03		3-5 exonuclease TREX1	Mus musculus 3-5 exonuclease TREX1	BG072232	Mm.17632	Energy/Metabolism	
2400								
2401	H3108E02		"Homo sapiens mitogen-activated protein kinase 6 (MAPK6), mRNA"		BG072253	Mm.18856	Signal Transduction	
2402								
2403	H3108E05		"Mus musculus RAS, dexamethasone- induced 1 (Rasd1), mRNA"		BG072256	Mm.3903	Signal Transduction	
2404								
2405	H3108F08		TF-1 cell apoptosis related protein-15	Mus musculus TF-1 cell apoptosis	BG085103	Mm.28441	Apoptosis	
			(Tfar15),	related protein-15 (Tfar15), mRNA				

2406									
2407	H3108H04	"Mus musculus adenyl cyclase type 9 mRNA, complete cds"				BG072288	Mm.4294	Signal Transduction	
2408									
2409	H3108H12	laminin B1			Mouse laminin B1 mRNA, complete cds	BG085129	Mm.148395	Apoptosis	
2410									
2411	H3109A04	"Mus musculus receptor (calcitonin) activity modifying protein 2 (Ramp2), mRNA"				BG072299	Mm.1574	Signal Transduction	
2412									
2413	H3109F07	ATPase, Ca++ transporting, cardiac muscle, slow twitch 2 (Atp2a2),			Mus musculus ATPase, Ca++ transporting, cardiac muscle, slow twitch 2 (Atp2a2), mRNA	BG085195	Mm.42255	Energy/Metabolism	
2414									
2415	H3110B08	tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, theta polypeptide (Ywha),			Mus musculus tyrosine 3-monooxygenase/tryptophan 5-monooxygenase activation protein, theta polypeptide (Ywha), mRNA	BG085234	Mm.14722	Energy/Metabolism	
2416									
2417	H3110B12	"Homo sapiens casein kinase I alpha isoform (CSNK1A1) mRNA, complete cds"				BG072410	Mm.43737	Signal Transduction	
2418									
2419	H3110F10	epoxide hydrolase 1, microsomal (Ephx1),			Mus musculus epoxide hydrolase 1, microsomal (Ephx1), mRNA	BG072453	Mm.9075	Energy/Metabolism	
2420									
2421	H3110H11	"Mouse brain calmodulin-dependent phosphatase (calcineurin) catalytic subunit mRNA, 3' end"				BG072475	Mm.293	Signal Transduction	
2422									
2423	H3111A02	brain cDNA, clone MNCb-1429, similar to peroxiredoxin V (PrxV) gene			Mus musculus brain cDNA, clone MNCb-1429, similar to Mus musculus peroxiredoxin V (PrxV) gene	BG085276	Mm.30215	Energy/Metabolism	

2424 2425	H3111A08	"Mus musculus signal transducer and transcription activator 5a (Stat5a) gene, partial cds"	"Mus musculus arginase type II (Arg2), mRNA, complete cds"	BG085280		Signal Transduction
2426 2427	H3111F09	Rat Y-b3 glutathione-S-transferase	Rat Y-b3 glutathione-S-transferase mRNA, complete cds	BG072517	Mm.29640	Energy/Metabolism
2428 2429	H3111G06	arginase type II (Arg2),	Mus musculus arginase type II (Arg2), mRNA	BG085317	Mm.3506	Energy/Metabolism
2430 2431	H3111G12	zinc transporter like 2 (Znt12)	Mus musculus zinc transporter like 2 (Znt12) mRNA, complete cds	BG085322	Mm.28490	Energy/Metabolism
2432 2433	H3112A04	Mus musculus carnitine palmitoyltransferase 2 (Cpt2), mRNA		BG085333	Mm.29499	Matrix/Structural Proteins
2434 2435	H3112B05	"Homo sapiens calcium-regulated heat-stable protein (24kD) (CRHSP-24), mRNA"		BG072550	Mm.33981	Heat Shock/Stress
2436 2437	H3112B07	Rat mRNA for 3-oxoacyl-CoA thiolase		BG085346	Mm.142498	Energy/Metabolism
2438 2439	H3112F06	"Mus musculus Cctb gene for chaperonin containing TCP-1 beta subunit, complete cds"		BG085384	Mm.3670	Heat Shock/Stress
2440 2441	H3112G09	Mus musculus ATPase, H ⁺ transporting, lysosomal (vacuolar proton pump), 42 kDa (Atp6d), mRNA		BG085399	Mm.1081	Energy/Metabolism
2442 2443	H3113B07	13kDa differentiation-associated protein (LOC55967),	Homo sapiens 13kDa differentiation-associated protein (LOC55967), mRNA	BG085428	Mm.27886	Energy/Metabolism

2444	H3113B08	F1F0ATP synthase complex E subunit (Atp5k) gene	Mus musculus F1F0ATP synthase complex E subunit (Atp5k) gene, complete cds		Mm.19370	Energy/Metabolism
2445						
2446		"Mus musculus MAP kinase-interacting serine/threonine kinase 2 (Mknk2), mRNA"		BG085457	Mm.6797	Signal Transduction
2447	H3113E03					
2448		"Mus musculus kappaB-Ras1 mRNA, complete cds"		BG072675	Mm.25648	Signal Transduction
2449	H3113F04					
2450		ribonuclease/angiogenin inhibitor	Homo sapiens ribonuclease/angiogenin inhibitor (RNH), mRNA	BG085471	Mm.6586	Energy/Metabolism
2451	H3113F06					
2452		"Homo sapiens phospholipase C, gamma 2 (phosphatidylinositol-specific) (PLCG2), mRNA"		BG085484	Mm.22370	Signal Transduction
2453	H3113G07					
2454		ornithine decarboxylase antizyme 3	Mus musculus ornithine decarboxylase antizyme 3 (Oaz3), mRNA	BG085485	Mm.154432	Energy/Metabolism
2455	H3113G08					
2456		"Mus musculus manic fringe homolog (Mfng), mRNA"		BG072704	Mm.517	Signal Transduction
2457	H3113H12					
2458		glutathione peroxidase 4 (Gpx4),	Mus musculus glutathione peroxidase 4 (Gpx4), mRNA	BG072706	Mm.2400	Energy/Metabolism
2459	H3114A05					
2460		spermidine/spermine N1-acetyl transferase (Sat),	Mus musculus spermidine/spermine N1-acetyl transferase (Sat), mRNA	BG085499	Mm.2734	Energy/Metabolism
2461	H3114A06					
2462		cytosolic class 3 aldehyde dehydrogenase (Aldh4) gene, 5 flanking region sequence	Mus musculus cytosolic class 3 aldehyde dehydrogenase (Aldh4) gene, 5 flanking region sequence	BG085522	Mm.14798	Energy/Metabolism
2463	H3114C12					
2464		M.musculus RPS3a gene	M.musculus RPS3a gene	BG072742	Mm.6957	Apoptosis
2465	H3114D10					

2466	H3114F11	Mus musculus interferon gamma receptor 2 (Ifngr2), mRNA		BG085554	Mm.153463	Signal Transduction
2467						
2468		"Mus musculus copper chaperone for superoxide dismutase (Ccsd) mRNA, complete cds"		BG072776	Mm.21414	Heat Shock/Stress
2469	H3114G12					
2470			Rattus norvegicus PiG-M mRNA for mannosyltransferase, complete cds	BG085572	Mm.26612	Energy/Metabolism
2471	H3114H06	PiG-M mannosyltransferase				
2472	H3115A05	"Mus musculus phospholipase C, delta (Plcd), mRNA"		BG085579	Mm.23963	Signal Transduction
2473						
2474	H3115B07	Mus musculus S100A9 gene for S100A9 protein exons 1-3		BG072801	Mm.2128	Signal Transduction
2475			Mus musculus clone UWGC:mbac82 from 14D1-D2 (T-Cell Receptor Alpha Locus), complete sequence	BG072808	Mm.353	Energy/Metabolism
2476	H3115C02					
2477		"Mus musculus protein phosphatase 2A B'alpha3 regulatory subunit mRNA, partial cds"		BG072817	Mm.3785	Signal Transduction
2478	H3115C11					
2479			Mus musculus mRNA for F1F0-ATP synthase, g subunit	BG072826	Mm.14663	Energy/Metabolism
2480	H3115D08	F1F0-ATP synthase, g subunit				
2481						
2482	H3115H06	ribosomal protein L29			Mm.2235	Energy/Metabolism
2483			Mus musculus mRNA for ATP synthase gamma-subunit precursor, complete cds	BG072870	Mm.12677	Energy/Metabolism
2484	H3115H10	ATP synthase gamma-subunit precursor				
2485			Mus musculus cytochrome c oxidase, subunit VIIa 3 (Cox7a3), mRNA	BG072912	Mm.2151	Energy/Metabolism
2486	H3116D11	cytochrome c oxidase, subunit VIIa 3 (Cox7a3),				

2487		"Mus musculus adenylate cyclase activating polypeptide 1 receptor 1 (Acyap1r1), mRNA"				BG085699	Mm.44245	Signal Transduction
2488	H3116E02							Energy/Metabolism
2489	H3116G12							
2490								
2491								
2492	H3117A12	kinesin-related mitotic motor protein			Mus musculus mRNA for kinesin-related mitotic motor protein		Mm.42203	
2493								
2494	H3117C04	"Homo sapiens MEBP-1 mRNA for MAPK-ERK binding protein-1, complete cds"				BG072981	Mm.6803	Heat Shock/Stress
2495								
2496	H3117G06	Rat glycogen phosphorylase brain isozyme, 5 end of cds			Rat glycogen phosphorylase brain isozyme mRNA, 5 end of cds	BG073025	Mm.30072	Energy/Metabolism
2497								
2498	H3118E12	apoptosis inhibitor bcl-x (bcl-x) gene, exon 3 and cds			Mus musculus apoptosis inhibitor bcl-x (bcl-x) gene, exon 3 and complete cds	AW548292	Mm.148197	Apoptosis
2499	H3118H09	mastocytoma N-deacetylase/N-sulfotransferase (Mndns), mRNA			Mus musculus mastocytoma N-deacetylase/N-sulfotransferase (Mndns), mRNA	BG085858	Mm.4084	Energy/Metabolism
2500								
2501	H3119A04	H+ ATP synthase subunit c			Mus musculus H+ ATP synthase subunit c mRNA, complete cds	BG085863	Mm.258	Energy/Metabolism
2502								
2503	H3119B04							Heat Shock/Stress
2504								
2505	H3119B06	Na, K-ATPase beta-3 subunit (Atp1b3) gene, exon 7 and cds			Mus musculus Na, K-ATPase beta-3 subunit (Atp1b3) gene, exon 7 and complete cds	BG073136	Mm.424	Energy/Metabolism
2506								
2507	H3119B09	cytochrome b-561 (Cyb561), mRNA			Mus musculus cytochrome b-561 (Cyb561), mRNA	BG085878	Mm.18942	Energy/Metabolism

2508			"Mus musculus protein tyrosine phosphatase 4a1 (Ptp4a1), mRNA"			BG073186	Mm.28909	Signal Transduction
2509	H3119G03		glutathione S-transferase, alpha 4 (Gsta4),					
2510					Mus musculus glutathione S-transferase, alpha 4 (Gsta4), mRNA	BG073190	Mm.2662	Energy/Metabolism
2511	H3119G08				Homo sapiens mRNA; cDNA DKFZp564A126 (from clone DKFZp564A126); partial cds			
2512						BG085933	Mm.22710	Energy/Metabolism
2513	H3119G12							
2514			Mus musculus FVB/N collagen pro-alpha-1 type I chain mRNA, complete cds			BG073196	Mm.22621	Matrix/Structural Proteins
2515	H3119H03							
2516			fatty-acid-Coenzyme A ligase, long-chain 3 (FACL3),		Homo sapiens fatty-acid-Coenzyme A ligase, long-chain 3 (FACL3), mRNA	BG073197	Mm.27944	Energy/Metabolism
2517	H3119H04							
2518			"Homo sapiens casein kinase 1, gamma 2 (CSNK1G2), mRNA"			BG085938	Mm.29873	Signal Transduction
2519	H3119H06							
2520			isocitrate dehydrogenase		Mus musculus isocitrate dehydrogenase mRNA, complete cds	BG085953	Mm.2966	Energy/Metabolism
2521	H3120A10							
2522			"Mus musculus MEK kinase 3, mRNA, partial cds"			BG085978	Mm.27041	Signal Transduction
2523	H3120D01							
2524			geranylgeranyl diphosphate synthase 1 (Ggps1),		Mus musculus geranylgeranyl diphosphate synthase 1 (Ggps1), mRNA	BG086008	Mm.4076	Energy/Metabolism
2525	H3120F08							
2526			full length insert cDNA clone ZC24D06		Homo sapiens full length insert cDNA clone ZC24D06	BG086026		Energy/Metabolism
2527	H3120H05							
2528			protein phosphatase type-1 catalytic subunit delta isom (PPCS1D)		Homo sapiens protein phosphatase type-1 catalytic subunit delta isoform (PPCS1D) mRNA, complete cds	BG086037	Mm.4572	Energy/Metabolism
2529	H3121A04							

2530	H3121C02	"Mus musculus follistatin-like (Fstl), mRNA"		BG086054	Mm.22763	Signal Transduction
2531		retinal short-chain dehydrogenase/reductase 1 (Rsdr1-pending), mRNA	Mus musculus retinal short-chain dehydrogenase/reductase 1 (Rsdr1-pending), mRNA			
2532	H3121E04			BG086076	Mm.14063	Energy/Metabolism
2533						
2534	H3122B07	"Mus musculus heat-responsive protein 12 (Hrsp12), mRNA"		BG073398	Mm.2607	Heat Shock/Stress
2535						
2536	H3122D07	"Mus musculus heat shock protein, 74 kDa, A (Hspa9a), mRNA"		BG073420	Mm.2849	Heat Shock/Stress
2537						
2538	H3122E12	ATP synthase beta subunit (ATPSB) gene	Human ATP synthase beta subunit (ATPSB) gene, complete cds	BG073436	Mm.17869	Energy/Metabolism
2539						
2540	H3122F01	ATP synthase beta subunit (ATPSB) gene	Human ATP synthase beta subunit (ATPSB) gene, complete cds	BG073437	Mm.17869	Energy/Metabolism
2541						
2542	H3122F04	ATP-binding cassette, sub-family D (ALD), member 4 (Abcd4), mRNA	Mus musculus ATP-binding cassette, sub-family D (ALD), member 4 (Abcd4), mRNA	BG086172	Mm.87806	Energy/Metabolism
2543						
2544	H3122F12	sterol-carrier protein X	Mus musculus sterol-carrier protein X mRNA, complete cds	BG086180	Mm.1779	Matrix/Structural Proteins
2545						
2546	H3122G01	sterol-carrier protein X	Mus musculus sterol-carrier protein X mRNA, complete cds	BG086181	Mm.1779	Matrix/Structural Proteins
2547						
2548	H3122H03	brain cDNA, clone MNCb-0663, similar to augment of liver regeneration (Alr)	Mus musculus brain cDNA, clone MNCb-0663, similar to Mus musculus augment of liver regeneration (Alr) mRNA	BG086194	Mm.28124	
2549						
2550	H3123C04	"Mus musculus GNB3 gene for GTP-binding protein beta3 subunit, complete cds"		BG073494	Mm.35708	Signal Transduction
2551						

2552	H3123D10	BCL2/adenovirus E1B 19kD-interacting protein 1 (BNIP1),	Homo sapiens BCL2/adenovirus E1B 19kD-interacting protein 1 (BNIP1), mRNA	BG073508	Mm.21795	Apoptosis
2553		mannoside acetylglucosaminyltransferase 1 (Mgat1), mRNA	Mus musculus mannoside acetylglucosaminyltransferase 1 (Mgat1), mRNA	BG073537	Mm.2672	Energy/Metabolism
2554	H3123G10	"Homo sapiens tumor protein p53-binding protein, 2 (TP53BP2), mRNA"		BG086271	Mm.23595	Signal Transduction
2555		novel cell death-regulatory protein GRIM19 (Grim19)	Mus musculus novel cell death-regulatory protein GRIM19 (Grim19) mRNA, complete cds	BG086273	Mm.21162	Apoptosis
2556	H3123H05	"Mus musculus cold inducible RNA-binding protein (Cirbp), mRNA"		BG086286	Mm.17898	Heat Shock/Stress
2557	H3124B02	ferrochelatase (Fech),	Mus musculus ferrochelatase (Fech), mRNA	BG086309	Mm.1070	Energy/Metabolism
2558	H3124D02	caspase 9 (Casp9),	Mus musculus caspase 9 (Casp9), mRNA	BG086310	Mm.102926	Apoptosis
2559	H3124D04	DNA fragmentation factor, 40 kD, beta subunit (Dffb),	Mus musculus DNA fragmentation factor, 40 kD, beta subunit (Dffb), mRNA	BG086312	Mm.38853	Apoptosis
2560	H3124D06	mitotic arrest deficient 1-like 1 (Mad1l1),	Mus musculus mitotic arrest deficient 1-like 1 (Mad1l1), mRNA		Mm.27250	Cell Cycle
2561	H3124D11	hepatocyte growth factor-like protein gene	Mouse hepatocyte growth factor-like protein gene, complete cds	BG073592	Mm.21989	Energy/Metabolism
2562	H3124E02	microsomal glutathione S-transferase (Gst),	Mus musculus microsomal glutathione S-transferase (Gst), mRNA	BG086330	Mm.14796	Energy/Metabolism

2574 2575	H3124H01	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 10 (22kD, PDSW) (NDUFB10),	Homo sapiens NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 10 (22kD, PDSW) (NDUFB10), mRNA	BG086348	Mm.8688	Energy/Metabolism
2576 2577	H3125A06	"Mus musculus glycogen synthase kinase 3 beta (Gsk3b), mRNA"		BG086363		Signal Transduction
2578 2579	H3125A09	glutathione peroxidase 3 (Gpx3),	Mus musculus glutathione peroxidase 3 (Gpx3), mRNA	BG073718	Mm.7156	Energy/Metabolism
2580 2581	H3125B05	"Homo sapiens heat shock transcription factor 2 binding protein (HSF2BP), mRNA"		BG086370	Mm.75856	Heat Shock/Stress
2582 2583	H3125C08	ribonuclease III (RN3)	Homo sapiens ribonuclease III (RN3) mRNA, complete cds	BG086378		Energy/Metabolism
2584 2585	H3125C10	major histocompatibility locus class III regions Hsc70t gene, partial cds; smRNP, G7A, NG23, MutS homolog, CLCP, NG24, NG25, and NG26 genes; and unknown genes	Mus musculus major histocompatibility locus class III regions Hsc70t gene, partial cds; smRNP, G7A, NG23, MutS homolog, CLCP, NG24, NG25, and NG26 genes, complete cds; and unknown genes	BG086380	Mm.1457	Energy/Metabolism
2586 2587	H3125D09	"Homo sapiens suppression of tumorigenicity 13 (colon carcinoma) (Hsp70-interacting protein) (ST13), mRNA"		BG086389	Mm.4908	Heat Shock/Stress
2588 2589	H3125E01	cytosolic acyl coenzyme A thioester hydrolase (HBACH),	Homo sapiens cytosolic acyl coenzyme A thioester hydrolase (HBACH), mRNA	BG086391	Mm.142740	Energy/Metabolism
2590 2591	H3125F03	thioredoxin (Txn),	Mus musculus thioredoxin (Txn), mRNA	BG086400	Mm.1275	Energy/Metabolism

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2612									
2613	H3129C06	protein-L-isoaspartate (D-aspartate) O-methyltransferase 1 (Pcnt1), mRNA	Mus musculus protein-L-isoaspartate (D-aspartate) O-methyltransferase 1 (Pcnt1), mRNA	BG086679	Mm.25169			Energy/Metabolism	
2614									
2615	H3129D08	"Homo sapiens candidate tumor suppressor p33 ING1 homolog LOC51147, mRNA"		BG086692	Mm.43482			Signal Transduction	
2616									
2617	H3129E06	OXA1L gene sequence	Homo sapiens OXA1L gene complete sequence	BG086699	Mm.142455			Apoptosis	
2618									
2619	H3129E10	"Mus musculus Pro-rich, PH, SH2 domain-containing signaling mediator (PSM) mRNA, complete cds"		BG086702	Mm.8538			Signal Transduction	
2620									
2621	H3129E12	Mus musculus IFN alpha-treated embryonic fibroblast mRNA		BG086704	Mm.23836			Heat Shock/Stress	
2622									
2623	H3129F04	clone TA-9 ATP synthase b chain homolog, partial cds	Mus musculus clone TA-9 ATP synthase b chain homolog mRNA, partial cds		Mm.30112			Energy/Metabolism	
2624									
2625	H3129G02	serine palmitoyltransferase, long chain base subunit 1 (Sptlc1), mRNA	Mus musculus serine palmitoyltransferase, long chain base subunit 1 (Sptlc1), mRNA	BG074002	Mm.6505			Energy/Metabolism	
2626									
2627	H3129G06	peroxisomal assembly protein PEX3P (Pex3) gene, promoter and exon 1	Mus musculus peroxisomal assembly protein PEX3P (Pex3) gene, promoter and exon 1	BG086720				Energy/Metabolism	
2628									
2629	H3129H03	hydroxylacyl-Coenzyme A dehydrogenase (Hadh), mRNA	Mus musculus hydroxylacyl-Coenzyme A dehydrogenase (Hadh), mRNA	BG086728	Mm.2491			Energy/Metabolism	
2630									
2631	H3129H05	K-Cl cotransporter KCC3	Homo sapiens K-Cl cotransporter KCC3 mRNA, complete cds	BG086729	Mm.21915			Energy/Metabolism	
2632									
2633	H3130B10	SERCA2 gene, alternative transcripts	Mus musculus SERCA2 gene, alternative transcripts	BG074044	Mm.42255			Energy/Metabolism	

2634	H3130B11	"Mouse Cu-Zn superoxide dismutase mRNA, complete cds"		BG074045	Mm.5274	Heat Shock/Stress
2635		"Mus musculus calcineurin inhibitor mRNA, complete cds, alternatively spliced"		BG086761	Mm.56	Signal Transduction
2636	H3130C02	Na,K-ATPase beta subunit (ATP1B) gene, exons 1 and 2	Human Na,K-ATPase beta subunit (ATP1B) gene, exons 1 and 2	BG086774		Energy/Metabolism
2637		NADH/NADPH mitogenic oxidase subunit p65-mox	Rattus norvegicus NADH/NADPH mitogenic oxidase subunit p65-mox mRNA, complete cds		Mm.2866	
2638	H3130D06	3-hydroxy-3-methylglutaryl-Coenzyme A synthase 2 mHS			Mm.10633	
2639	H3130H07	"Mus musculus heat shock protein, 86 kDa 1 (Hsp86-1), mRNA"		BG074109	Mm.1843	Heat Shock/Stress
2640	H3131A03	ATP synthase gamma-subunit precursor	Mus musculus mRNA for ATP synthase gamma-subunit precursor, complete cds	BG074111	Mm.12677	Energy/Metabolism
2641	H3131A05	enoyl coenzyme A hydratase 1, peroxisomal (Ech1), mRNA	Mus musculus enoyl coenzyme A hydratase 1, peroxisomal (Ech1), mRNA	BG074113	Mm.2112	Energy/Metabolism
2642	H3131A07	MA-3 (apoptosis-related gene)	Mouse MA-3 (apoptosis-related gene) mRNA, complete cds	BG086831	Mm.26035	Apoptosis
2643	H3131A12	sterol-carrier protein X	Mus musculus sterol-carrier protein X mRNA, complete cds	BG086835	Mm.1779	Matrix/Structural Proteins
2644	H3131B04	dolichyl-di-phosphooligosaccharide-protein glycotransferase (Ddost), mRNA	Mus musculus dolichyl-di-phosphooligosaccharide-protein glycotransferase (Ddost), mRNA	BG074138	Mm.7236	Energy/Metabolism
2645	H3131C10					

2656				Mus musculus solute carrier family 39 (iron-regulated transporter), member 1 (Slc39a1), mRNA	BG074144	Mm.28756	Energy/Metabolism
2657	H3131D05	solute carrier family 39 (iron-regulated transporter), member 1 (Slc39a1),		Mus musculus caspase 12 (Casp12), mRNA	BG086881	Mm.42163	Apoptosis
2658							
2659	H3131G02	caspase 12 (Casp12),			BG086892	Mm.30016	Signal Transduction
2660							
2661	H3131H01	H.sapiens gene for rho GDP dissociation inhibitor (GDI)			BG086925	Mm.734	Signal Transduction
2662		"Mus musculus neuroblastoma ras oncogene (Nras), mRNA"					
2663	H3132C10				BG074245	Mm.23923	Signal Transduction
2664		"Homo sapiens pleiomorphic adenoma gene-like 2 (PLAGL2), mRNA"					
2665	H3132F06						
2666		"Homo sapiens ER-associated DNAJ; ER-associated Hsp40 co-chaperone; hdj9; ERj3 (LOC51726), mRNA"			BG086956	Mm.37516	Heat Shock/Stress
2667	H3132G04						
2668					BG086960	Mm.27082	Energy/Metabolism
2669	H3132G09	vacuolar ATPase subunit H					
2670		"Mus musculus tumor susceptibility protein 101 (tsg101) gene, complete cds"			BG086965	Mm.22688	Signal Transduction
2671	H3132H07						
2672							
2673	H3133A06	glutathione S-transferase, mu 1 (Gstm1), mu 1 (Gstm1), mRNA			BG086970	Mm.2011	Energy/Metabolism
2674							
2675	H3133B05	cytochrome c oxidase subunit VIIb (COX6B),			BG074277	Mm.400	Energy/Metabolism
2676							
2677	H3133C08	"Mus musculus RAB7, member RAS oncogene family (Rab7), mRNA"			BG086994	Mm.4268	Signal Transduction

2678									
2679	H3133D04	NADH dehydrogenase (ubiquinone) flavoprotein 2 (24kD) (NDUFV2),			Homo sapiens NADH dehydrogenase (ubiquinone) flavoprotein 2 (24kD) (NDUFV2), mRNA	BG087002	Mm.2206		Energy/Metabolism
2680									
2681	H3133D06						Mm.21535		Heat Shock/Stress
2682									
2683	H3133E07	glycine amidinotransferase (L-arginine:glycine amidinotransferase) (GATM),			Homo sapiens glycine amidinotransferase (L-arginine:glycine amidinotransferase) (GATM), mRNA	BG087011	Mm.29975		Energy/Metabolism
2684									
2685	H3133H01	"Mus musculus heat shock 70 protein (Hsc70) gene, complete cds"				BG087043	Mm.2144		Heat Shock/Stress
2686									
2687	H3133H05	M. musculus arylsulfatase A			M. musculus mRNA for arylsulfatase A	BG087046	Mm.620		Energy/Metabolism
2688									
2689	H3133H07	voltage-dependent anion channel 3 (Vdac3),			Mus musculus voltage-dependent anion channel 3 (Vdac3), mRNA	BG087048	Mm.133962		Energy/Metabolism
2690									
2691	H3134C07	DNA, DLEC1 to ORCTL4 gene region, section 1/2 (DLEC1, ORCTL3, ORCTL4 genes, complete cds)			Homo sapiens DNA, DLEC1 to ORCTL4 gene region, section 1/2 (DLEC1, ORCTL3, ORCTL4 genes, complete cds)	BG087037	Mm.42275		Energy/Metabolism
2692									
2693	H3134D06	GrpE-like 2, mitochondrial mt-GrpE#2					Mm.12959		Heat Shock/Stress
2694									
2695	H3135A03	NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 8 (19kD, PGIV) (NDUFA8),			Homo sapiens NADH dehydrogenase (ubiquinone) 1 alpha subcomplex, 8 (19kD, PGIV) (NDUFA8), mRNA	BG087056	Mm.19834		Energy/Metabolism
2696									
2697	H3135B06	cDNA DKFZp434D175 (from clone DKFZp434D175); partial cds			Homo sapiens mRNA; cDNA DKFZp434D175 (from clone DKFZp434D175); partial cds	BG087066	Mm.30110		Energy/Metabolism
2698									
2699	H3135B10	"Mus musculus PL-6 (Pl6), mRNA"				BG087070	Mm.27312		Signal Transduction

2700				Mus musculus galactose-1-phosphate uridylyltransferase (GALT) gene, complete cds	BG087088	Mm.2420	Energy/Metabolism
2701	H3135D06	galactose-1-phosphate uridylyltransferase (GALT) gene					Energy/Metabolism
2702							Energy/Metabolism
2703	H3135F04	Mm.87124					Heat Shock/Stress
2704	H3135F06						Heat Shock/Stress
2705							Energy/Metabolism
2706	H3135G03	serine protease inhibitor 3 (Spi3),		Mus musculus serine protease inhibitor 3 (Spi3), mRNA	BG087117	Mm.2623	Energy/Metabolism
2707							Energy/Metabolism
2708	H3135G07	protoporphyrinogen oxidase (Ppox),		Mus musculus protoporphyrinogen oxidase (Ppox), mRNA	BG087120	Mm.4730	Energy/Metabolism
2709							Energy/Metabolism
2710	H3135H04	rhodanese (Tst)		Mus musculus rhodanese (Tst) mRNA, complete cds		Mm.15312	Energy/Metabolism
2711							Energy/Metabolism
2712	H3135H10	D-dopachrome tautomerase gene		Mus musculus D-dopachrome tautomerase gene, complete cds	BG087134	Mm.5731	Energy/Metabolism
2713							Energy/Metabolism
2714	H3136A06	calcium-sensitive chloride conductance protein-1 (mCLCA1)		Mus musculus calcium-sensitive chloride conductance protein-1 (mCLCA1) mRNA, complete cds	BG087141	Mm.20897	Energy/Metabolism
2715							Energy/Metabolism
2716	H3136B09	branched chain ketoacid dehydrogenase E1, alpha polypeptide (Bckdha),		Mus musculus branched chain ketoacid dehydrogenase E1, alpha polypeptide (Bckdha), mRNA	BG087153	Mm.25848	Energy/Metabolism
2717							Apoptosis
2718	H3136C07	BCL2/adenovirus E1B 19 kDa-interacting protein 1, NIP3, (Bnip3),		Mus musculus BCL2/adenovirus E1B 19 kDa-interacting protein 1, NIP3 (Bnip3), mRNA	BG087162	Mm.2159	Apoptosis
2719							Energy/Metabolism
2720	H3136D05	serine protease		Mus musculus serine protease mRNA, complete cds	BG087171	Mm.24276	Energy/Metabolism
2721							Energy/Metabolism
2722	H3136E12	gene uncoupling protein-2		Mus musculus gene for uncoupling protein-2, complete cds		Mm.144413	Energy/Metabolism
2723							Energy/Metabolism
2724	H3136F07	guanine monophosphate synthetase (GMPS),		Homo sapiens guanine monophosphate synthetase (GMPS), mRNA	BG087194	Mm.28299	Energy/Metabolism

2725	H3136F10	serine protease inhibitor 3 (Spi3),	Mus musculus serine protease inhibitor 3 (Spi3), mRNA	BG087196		Energy/Metabolism
2726						
2727		solute carrier family 12, member 2	Mus musculus solute carrier family 12, member 2 (Slc12a2), mRNA	BG074576	Mm.4168	Energy/Metabolism
2728	H3136G10	(Slc12a2),				
2729		"Mus musculus IkB kinase-beta (Ikkb)		BG087220	Mm.28269	Signal Transduction
2730	H3136H12	mRNA, complete cds"				
2731			Mus musculus pyruvate decarboxylase (Pcx), mRNA	BG087228	Mm.1845	Energy/Metabolism
2732	H3137A09	pyruvate decarboxylase (Pcx),				
2733			Mus musculus ornithine aminotransferase (Oat), mRNA	BG087236	Mm.13694	Energy/Metabolism
2734	H3137B06	ornithine aminotransferase (Oat),				
2735		"Homo sapiens Rho guanine nucleotide exchange factor (GEF) 4 (ARHGEF4), mRNA"		BG087239	Mm.41604	Signal Transduction
2736	H3137B09					
2737		ATP-binding cassette, sub-family A	Homo sapiens ATP-binding cassette, sub-family A (ABC1), member 3 (ABCA3), mRNA	BG087249	Mm.38313	Energy/Metabolism
2738	H3137C10	(ABC1), member 3 (ABCA3),				
2739		ATP-binding cassette, sub-family E	Mus musculus ATP-binding cassette, sub-family E (OABP), member 1 (Abce1), mRNA	BG087256	Mm.5831	Energy/Metabolism
2740	H3137D07	(OABP), member 1 (Abce1),				
2741			Mus musculus VLCAD gene	BG074630	Mm.18630	Energy/Metabolism
2742	H3137D08	VLCAD gene				
2743		solute carrier family 4 (anion	Mus musculus solute carrier family 4 (anion exchanger), member 2 (Slc4a2), mRNA	BG074631	Mm.4580	Energy/Metabolism
2744	H3137D09	exchanger), member 2 (Slc4a2),				
2745			Homo sapiens NADH dehydrogenase (ubiquinone) Fe-S protein 2 (49kD) (NADH-coenzyme Q reductase) (NDUFS2), mRNA			
2746	H3137E02	Q reductase) (NDUFS2),		BG087262	Mm.21669	Energy/Metabolism

2747	H3137E03	anion exchanger 3 brain and anion exchanger 3 cardiac isoforms (Slc4a3) gene, alternatively spliced	Mus musculus anion exchanger 3 brain and anion exchanger 3 cardiac isoforms (Slc4a3) gene, complete cds, alternatively spliced	BG074636	Mm.5053	Energy/Metabolism
2749	H3137G05	ribosomal protein L17 isolog (LOC63875),	Homo sapiens ribosomal protein L17 isolog (LOC63875), mRNA	BG087283	Mm.44225	Energy/Metabolism
2751	H3137G09	Mouse mRNA for protein tyrosine phosphatase PTP9		BG087286	Mm.4220	Signal Transduction
2753	H3138B02	neuronal apoptosis inhibitory protein 6 (Naip6) gene; and Naip3 gene, exons 2-9 and 11-16	Mus musculus neuronal apoptosis inhibitory protein 6 (Naip6) gene, complete cds; and Naip3 gene, exons 2-9 and 11-16	BG087312	Mm.13437	Apoptosis
2755	H3138C04	phosphoglucomutase 1 (PGM1),	Homo sapiens phosphoglucomutase 1 (PGM1), mRNA	BG087325	Mm.22403	Energy/Metabolism
2757	H3138D04	hypothetical protein FLJ10545 (FLJ10545),	Homo sapiens hypothetical protein FLJ10545 (FLJ10545), mRNA	BG074710	Mm.9870	Energy/Metabolism
2759	H3138D07	voltage-dependent anion channel 2 (Vdac2),	Mus musculus voltage-dependent anion channel 2 (Vdac2), mRNA	BG087336	Mm.569	Energy/Metabolism
2761	H3138E10	aldehyde dehydrogenase 5 (ALDH5),	Homo sapiens aldehyde dehydrogenase 5 (ALDH5), mRNA	BG087349	Mm.24457	Energy/Metabolism
2763	H3138F05	ADP-ribosylation factor 4 (Arf4),	Mus musculus ADP-ribosylation factor 4 (Arf4), mRNA	BG087356	Mm.1486	Energy/Metabolism
2765	H3138G02	solute carrier family 22 (organic cation transporter), member 5 (Slc22a5),	Mus musculus solute carrier family 22 (organic cation transporter), member 5 (Slc22a5), mRNA	BG087364	Mm.42253	Energy/Metabolism

2767 2768	H3138G09	alpha glucosidase 2, alpha neutral subunit (G2an),	Mus musculus alpha glucosidase 2, alpha neutral subunit (G2an), mRNA	BG087370	Mm.3196	Energy/Metabolism
2769 2770	H3138H04	long-chain acyl-CoA synthetase	Homo sapiens mRNA for long-chain acyl-CoA synthetase, complete cds	BG074754	Mm.28962	Energy/Metabolism
2771 2772	H3138H07	78 kDa gastrin-binding protein	Human 78 kDa gastrin-binding protein mRNA, complete cds	BG087380	Mm.16773	Energy/Metabolism
2773 2774	H3138H10	M.musculus mRNA for cathepsin D		BG087383	Mm.2147	Signal Transduction
2775 2776	H3139B06	"Mus musculus protein tyrosine phosphatase, non-receptor type 13 interacting protein (Ptpn13ip), mRNA"		BG087401	Mm.5400	Signal Transduction
2777 2778	H3139C01	ubi-d4/requiem gene, exons 2 through 11 and partial cds	Mus musculus ubi-d4/requiem gene, exons 2 through 11 and partial cds	BG087408	Mm.2651	Apoptosis
2779 2780	H3139E01	"Mus musculus heat shock 70 protein (Hsc70) gene, complete cds"		BG087426		Heat Shock/Stress
2781 2782	H3139F01	sterol O-acyltransferase 1 (Soat1),	Mus musculus sterol O-acyltransferase 1 (Soat1), mRNA	BG087432	Mm.28099	Energy/Metabolism
2783 2784	H3140A02	solute carrier family 9 (sodium/hydrogen exchanger), member 1 (Slc9a1),	Mus musculus solute carrier family 9 (sodium/hydrogen exchanger), member 1 (Slc9a1), mRNA	BG087460	Mm.4312	Energy/Metabolism
2785 2786	H3140A08	"Mus musculus mitogen activated protein kinase 14 (Mapk14), mRNA"		BG087465	Mm.4437	Signal Transduction

2787		CPT I=carnitine palmitoyltransferase I {3 region} [mice, JVS, hearts, Partial, H3140A09] 678 nt, segment 1 of 2]	CPT I=carnitine palmitoyltransferase I {3 region} [mice, JVS, hearts, mRNA Partial, 678 nt, segment 1 of 2]		Mm.18522	Energy/Metabolism
2788						
2789		major histocompatibility locus class III region:butyrophilin-like protein gene, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, H3140B07] palmitoyl-protein thioestera	Mus musculus major histocompatibility locus class III region:butyrophilin-like protein gene, partial cds; Notch4, PBX2, RAGE, lysophatidic acid acyl transferase-alpha, palmitoyl-protein thioestera		Mm.1511	
2791						
2792	H3140C11	clone RP11-486I22, sequence	Homo sapiens clone RP11-486I22, complete sequence	BG074864	Mm.3479	Energy/Metabolism
2793		ectonucleotide	Homo sapiens ectonucleotide			
2794	H3140D05	pyrophosphatase/phosphodiesterase 5 (putative function) (ENPP5),	pyrophosphatase/phosphodiesterase 5 (putative function) (ENPP5), mRNA	BG087491	Mm.30145	Energy/Metabolism
2795			Mus musculus peroxiredoxin 3 (Prdx3), mRNA	BG087493	Mm.29821	Energy/Metabolism
2796	H3140D07	peroxiredoxin 3 (Prdx3),				
2797		electron-transfer-flavoprotein, alpha polypeptide (glutaric aciduria II)	Homo sapiens electron-transfer- flavoprotein, alpha polypeptide (glutaric aciduria II) (ETFA), mRNA			
2798	H3140D12	(ETFA),		BG087498	Mm.26949	Energy/Metabolism
2799						
2800	H3140E04	protein tyrosine phosphatase (70zshp)	Mouse protein tyrosine phosphatase (70zshp) mRNA, complete cds	BG074880	Mm.1484	Energy/Metabolism
2801						
2802	H3140E08	glutamate dehydrogenase (GluD),	Mus musculus glutamate dehydrogenase (GluD), mRNA	BG087506	Mm.10600	Energy/Metabolism
2803						
2804	H3141F03	solute carrier family 12, member 7 (Slc12a7),	Mus musculus solute carrier family 12, member 7 (Slc12a7), mRNA	BG087669	Mm.24510	Energy/Metabolism

2805	H3141G03	chs HMG CoA synthase , partial cds	Mus musculus chs HMG CoA synthase mRNA, partial cds	BG087678	Mm.10633	Matrix/Structural Proteins
2806						
2807		"Mus musculus protein phosphatase 2a, catalytic subunit, beta isoform (Ppp2cb), mRNA"		BG087694	Mm.7418	Signal Transduction
2808	H3142A02					
2809		ubiquinol-cytochrome c reductase core protein II (UQCRC2), mRNA	Homo sapiens ubiquinol-cytochrome c reductase core protein II (UQCRC2), mRNA	BG075002	Mm.988	Energy/Metabolism
2810	H3142A08					
2811		"Mus musculus tumor-suppressing subchromosomal transferable fragment 4 (Tssc4), mRNA"		BG087715	Mm.139675	Signal Transduction
2812	H3142E09				Mm.31203	Heat Shock/Stress
2813	H3142G01					
2814		methylenetetrahydrofolate dehydrogenase (NADP+ dependent), methenyltetrahydrofolate cyclohydrolase, myltetrahydrofolate synthetase (MTHFD1), mRNA	Homo sapiens methylenetetrahydrofolate dehydrogenase (NADP+ dependent), methenyltetrahydrofolate cyclohydrolase, formyltetrahydrofolate synthetase (MTHFD1), mRNA	BG087719	Mm.29584	Energy/Metabolism
2815	H3142G02					
2816		peroxisome membrane protein PEX2	Mus musculus peroxisome membrane protein PEX2 mRNA, complete cds	BG075110	Mm.16453	Energy/Metabolism
2817	H3143D09					
2818		"Mouse cAMP-dependent protein kinase alpha subunit gene, exon 10"		BG075111	Mm.19111	Signal Transduction
2819	H3143D10					
2820		presenilin-associated protein	Homo sapiens presenilin-associated protein mRNA, complete cds	BG087589	Mm.29650	Energy/Metabolism
2821	H3143D12					

2822	H3143H07	"Mus musculus osmotic stress protein 94 (Osp94) mRNA, complete cds"		BG075154	Mm.4150	Heat Shock/Stress
2823						
2824	H3144B03	NADH-ubiquinone dehydrogenase 1 beta subcomplex mRNA, complete cds	Homo sapiens NADH-ubiquinone dehydrogenase 1 beta subcomplex mRNA, complete cds	BG087636	Mm.4537	Energy/Metabolism
2825						
2826	H3144C01	glyoxalase I (GLO1),	Homo sapiens glyoxalase I (GLO1), mRNA	BG087642	Mm.17362	Energy/Metabolism
2827						
2828	H3144C11	"Mus musculus heat shock 70kD protein 5 (glucose-regulated protein, 78kD) (Hspa5), mRNA"		BG087650	Mm.24162	Heat Shock/Stress
2829						
2830	H3144E06	neuronal cell death related gene in neuron -7 (DN-7)	Rattus norvegicus neuronal cell death related gene in neuron -7 (DN-7) mRNA, complete cds	AW555571	Mm.19440	Apoptosis
2831						
2832	H3144F09	"Homo sapiens RAB7, member RAS oncogene family-like 1 (RAB7L1), mRNA"		BG075214	Mm.34027	Signal Transduction
2833						
2834	H3144G02	"Homo sapiens phosphodiesterase 5A, cGMP-specific (PDE5A), mRNA"		BG087768	Mm.103149	Signal Transduction
2835	H3144H01	mitofilin, partial cds	Homo sapiens mitofilin mRNA, partial cds		Mm.10706	
2836						
2837	H3145A03	"Mus musculus partial Prkar1a gene for cAMP-dependent protein kinase regulatory subunit R1alpha, exons 8-10 and 3'UTR"		BG075240	Mm.30039	Signal Transduction
2838						
2839	H3145A06	zinc transporter ZnT-3 (ZnT-3)	Mus musculus zinc transporter ZnT-3 (ZnT-3) mRNA, complete cds	BG075243	Mm.1396	Energy/Metabolism
2840						

2841	H3145E01	H.sapiens gene phosphate carrier	H.sapiens gene for phosphate carrier	BG075286	Mm.5246	Energy/Metabolism
2842			Mus musculus hyaluronidase 2 (Hyal2), mRNA	BG075294	Mm.4834	Energy/Metabolism
2843	H3145E12	hyaluronidase 2 (Hyal2),				Heat Shock/Stress
2844						
2845	H3145F11					
2846						
2847		M.musculus mRNA for mitogen		BG075319	Mm.8385	Signal Transduction
2848	H3145H03	activated protein kinase (erk-1)				
2849			Mus musculus peroxiredoxin 4 (Prdx4), mRNA	BG075324	Mm.19127	Energy/Metabolism
2850	H3145H09	peroxiredoxin 4 (Prdx4),				
2851			Mus musculus peroxiredoxin 4 (Prdx4), mRNA	BG087872	Mm.19127	Energy/Metabolism
2852	H3145H10	peroxiredoxin 4 (Prdx4),				
2853		"Mus musculus myo-inositol 1-phosphate synthase A1 (IsynA1) mRNA, complete cds"		BG075331	Mm.29357	Signal Transduction
2854	H3146A04					
2855		cDNA FLJ13847 fis, clone THYRO1000852, highly similar to Human branched-chain amino acid aminotransferase (ECA40)	Homo sapiens cDNA FLJ13847 fis, clone THYRO1000852, highly similar to Human branched-chain amino acid aminotransferase (ECA40) mRNA	BG087895	Mm.24210	Energy/Metabolism
2856	H3146B10	aminotransferase (ECA40)				
2857		RHOA proto-oncogene multi-drug-resistance protein, 3 end	Homo sapiens RHOA proto-oncogene multi-drug-resistance protein mRNA, 3 end	BG087931	Mm.757	Energy/Metabolism
2858	H3146F01					
2859		cDNA: FLJ22871 fis, clone KAT02533	Homo sapiens cDNA: FLJ22871 fis, clone KAT02533		Mm.30065	Energy/Metabolism
2860	H3146G06	CTL2 gene		BG087957	Mm.28209	Energy/Metabolism
2861	H3146H06					
2862		"Mus musculus RAB11B, member RAS oncogene family (Rab11b), mRNA"		BG087979	Mm.35727	Signal Transduction
2863	H3147B08					
2864						

2865	H3147D12	apoptosis inhibitory protein 5 (Api5),	Mus musculus apoptosis inhibitory protein 5 (Api5), mRNA	BG088003	Mm.692	Apoptosis
2866						
2867		"Mus musculus signal transducer and activator of transcription 3 interacting protein 1 (Stat3ip1-pending), mRNA"				
2868	H3147E03			BG088006	Mm.25298	Signal Transduction
2869						
2870	H3147E04	"Mus musculus heat shock protein, 84 kDa 1 (Hsp84-1), mRNA"		BG088007	Mm.2180	Heat Shock/Stress
2871						
2872	H3147E05	"Mus musculus heat shock protein, 84 kDa 1 (Hsp84-1), mRNA"		BG088008	Mm.2180	Heat Shock/Stress
2873						
2874	H3147E06	"Mus musculus heat shock protein, 84 kDa 1 (Hsp84-1), mRNA"		BG088009	Mm.2180	Heat Shock/Stress
2875						
2876	H3148B04	ferredoxin reductase (Fdxr),	Mus musculus ferredoxin reductase (Fdxr), mRNA	BG088056	Mm.4719	Energy/Metabolism
2877						
2878	H3148E08	ornithine decarboxylase antizyme gene	Mus musculus ornithine decarboxylase antizyme gene, complete cds	BG088091	Mm.683	Energy/Metabolism
2879						
2880	H3148F05	NADH dehydrogenase (ubiquinone) Fe-S protein 1 (75kD) S protein 1 (75kD) (NADH-coenzyme Q reductase) (NDUFS1), mRNA	Homo sapiens NADH dehydrogenase (ubiquinone) Fe-S protein 1 (75kD) (NADH-coenzyme Q reductase) (NDUFS1), mRNA	BG088100	Mm.2041	Energy/Metabolism
2881						
2882	H3148G06	"Mus musculus MgcRacGAP mRNA for GTPase activating protein, complete cds"		BG088110	Mm.27141	Signal Transduction
2883						
2884	H3149B10	"Mus musculus protein kinase C, zeta"		BG088144	Mm.28561	Signal Transduction

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2909	H3151F06	M. musculus xanthine dehydrogenase	M. musculus mRNA for xanthine dehydrogenase	BG075778	Mm.11223	Energy/Metabolism
2910						
2911	H3152A02	Rat beta-galactoside-alpha 2,6-sialyltransferase	Rat beta-galactoside-alpha 2,6-sialyltransferase mRNA	BG075800	Mm.1944	Energy/Metabolism
2912						
2913	H3152D06	5-aminolevulinic acid synthase, 3 end	Mouse 5-aminolevulinic acid synthase mRNA, 3 end	BG088378	Mm.1217	Energy/Metabolism
2914						
2915	H3152G07	MAD2 (mitotic arrest deficient, yeast, homolog)-like 2 (MAD2L2),	Homo sapiens MAD2 (mitotic arrest deficient, yeast, homolog)-like 2 (MAD2L2), mRNA		Mm.9648	Cell Cycle
2916						
2917	H3152H05	ATPase, class II, type 9A (Atp9a),	Mus musculus ATPase, class II, type 9A (Atp9a), mRNA	BG075876	Mm.10288	Energy/Metabolism
2918						
2919	H3152H07	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 5 (NDUFB5),	Homo sapiens NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 5 (16kD, SGDH) (NDUFB5), mRNA	BG088418	Mm.28058	Energy/Metabolism
2920						
2921	H3153A02	"Mus musculus calpain small subunit gene, exons 3 through 9 and partial cds"		BG088424	Mm.6534	Signal Transduction
2922						
2923	H3153A07	"Homo sapiens zinedin (ZIN), mRNA"		BG088429	Mm.21612	Signal Transduction
2924						
2925	H3153B11	Mm.666			Mm.666	Energy/Metabolism
2926						
2927	H3153C09	Mus musculus tissue inhibitor of metalloproteinase 2 (Timp2), mRNA		BG088451	Mm.19191	Matrix/Structural Proteins
2928						
2929						
2930	H3153C10	"Homo sapiens protein phosphatase 2 (formerly 2A), regulatory subunit A (PR 65), beta isoform (PPP2R1B), mRNA"		BG088452	Mm.21428	Signal Transduction
2931						
2932	H3153D05	"Rattus norvegicus Diacylglycerol kinase 90kDa (Dagk), mRNA"		BG075920	Mm.102207	Signal Transduction

2933				Mus musculus p75NTR-associated cell death executor (Nade) mRNA, complete cds	BG088461	Mm.90787	Apoptosis
2934	H3153D07	p75NTR-associated cell death executor (Nade)					
2935							
2936	H3153E04	NADH dehydrogenase (ubiquinone) 1 beta subcomplex, 7 (18kD, B18) (NDUFB7), mRNA			BG088469	Mm.29683	Energy/Metabolism
2937							
2938	H3153E08	M. musculus mRNA for MAP kinase-activated protein kinase 2			BG088472	Mm.29725	Signal Transduction
2939							
2940	H3153F08	apoptotic cell clearance receptor PtdSerR		Mus musculus apoptotic cell clearance receptor PtdSerR mRNA, complete cds	BG088494	Mm.38825	Apoptosis
2941							
2942	H3153G02	endonuclease G-like 1 (ENDOGL1), mRNA		Homo sapiens endonuclease G-like 1 (ENDOGL1), mRNA	BG088499	Mm.11669	Energy/Metabolism
2943							
2944	H3153G08	"Mus musculus RAS-related C3 botulinum substrate 2 (Rac2), mRNA"			BG088482	Mm.1972	Signal Transduction
2945							
2946	H3153H05	peroxisomal delta3, delta2-enoyl-Coenzyme A isomerase (Peci-pending), mRNA		Mus musculus peroxisomal delta3, delta2-enoyl-Coenzyme A isomerase (Peci-pending), mRNA	BG075962	Mm.28883	Energy/Metabolism
2947							
2948	H3154A03	"Mus musculus RAN, member RAS oncogene family (Ran), mRNA"			BG088511	Mm.7521	Signal Transduction
2949							
2950	H3154C11	M.musculus glutamyl-tRNA synthetase		M.musculus mRNA for glutamyl-tRNA synthetase	BG088535	Mm.27190	Energy/Metabolism
2951							
2952	H3154E07	"Mus musculus growth arrest specific 6 (Gas6), mRNA"			BG088548	Mm.3982	Signal Transduction
2953							
2954	H3154F02	asparagine synthetase		Mus musculus asparagine synthetase mRNA, complete cds	BG088553	Mm.2942	Energy/Metabolism

2955	H3155B01	beclin 1 (coiled-coil, myosin-like BCL2-interacting protein) (Becn1), mRNA	Mus musculus beclin 1 (coiled-coil, myosin-like BCL2-interacting protein) (Becn1), mRNA	BG088587	Mm.30040	Apoptosis
2956						
2957	H3155B07	NADH dehydrogenase (ubiquinone) Fe-S protein 3 (30kD) (NADH-coenzyme Q reductase) (NDUFS3), mRNA	Homo sapiens NADH dehydrogenase (ubiquinone) Fe-S protein 3 (30kD) (NADH-coenzyme Q reductase) (NDUFS3), mRNA	BG076060	Mm.30113	Energy/Metabolism
2958						
2959	H3155C04	"Rattus norvegicus mRNA for inositol hexakisphosphate kinase, complete cds"		BG076067	Mm.22360	Signal Transduction
2960						
2961	H3155C10	UDP glucuronosyltransferase (UGT1-06)	Mus musculus UDP glucuronosyltransferase (UGT1-06) mRNA, complete cds	BG076072	Mm.42472	Energy/Metabolism
2962						
2963	H3155E04	NDUFV1 gene, exons 6-10	Homo sapiens NDUFV1 gene, exons 6-10	BG076088	Mm.29842	Energy/Metabolism
2964						
2965	H3155F02					Heat Shock/Stress
2966						
2967	H3155G03	Rat endoplasmic reticulum alpha-mannosidase	Rat endoplasmic reticulum alpha-mannosidase mRNA, complete cds	BG088635	Mm.33138	Energy/Metabolism
2968						
2969	H3156A10					Apoptosis
2970						
2971	H3156C03	"Mus musculus protein phosphatase 1D magnesium-dependent, delta isoform (Ppm1d), mRNA"		BG088678	Mm.61848	Signal Transduction
2972						
2973	H3156C05	cDNA DKFZp586F2224 (from clone DKFZp586F2224)	Homo sapiens mRNA; cDNA DKFZp586F2224 (from clone DKFZp586F2224)	BG076153	Mm.28030	Energy/Metabolism
2974						
2975	H3156C08	"Mus musculus metaxin (Mtx), mRNA"		BG076156	Mm.22508	Heat Shock/Stress
2976						

2977	H3156H04	H3156H04						Energy/Metabolism
2978	H3157B03	catalase 1 (Cas1),			Mus musculus putative phosphatase (Pps), mRNA	BG076224	Mm.1458	Energy/Metabolism
2979								
2980								
2981		"Mus musculus heat shock protein, DNAL-like 2 (Hs2), mRNA"						
2982	H3157B10					BG088755	Mm.27897	Heat Shock/Stress
2983								
2984	H3157C04	caspase 6 (Casp6),			Mus musculus catalase 1 (Cas1), mRNA	BG076235	Mm.4215	Energy/Metabolism
2985								
2986	H3157C09	M. musculus aspartate aminotransferase gene exon 10 and 3-flank			Mus musculus caspase 6 (Casp6), mRNA	BG076240	Mm.28814	Apoptosis
2987								
2988	H3157D01	M. musculus aspartate aminotransferase gene exon 10 and 3-flank			M. musculus aspartate aminotransferase gene exon 10 and 3-flank	BG076244	Mm.18916	Matrix/Structural Proteins
2989								
2990	H3157D12	microsomal glutathione S-transferase 3 (MGST3),			Homo sapiens microsomal glutathione S-transferase 3 (MGST3), mRNA	BG088778	Mm.29823	Energy/Metabolism
2991								
2992	H3157E04	"Mus musculus phosphatidylinositol 3-kinase, catalytic, alpha polypeptide (Pik3ca), mRNA"				BG088781	Mm.41943	Signal Transduction
2993								
2994	H3157E05	solute carrier family 30 (zinc transporter), member 4 (Slc30a4),			Mus musculus solute carrier family 30 (zinc transporter), member 4 (Slc30a4), mRNA	BG076257	Mm.27801	Energy/Metabolism
2995								
2996	H3157H01	sterol O-acyltransferase 1 (Soat1),			Mus musculus sterol O-acyltransferase 1 (Soat1), mRNA	BG088808	Mm.28099	Matrix/Structural Proteins
2997								
2998	H3158B04	ornithine decarboxylase antizyme inhibitor (Oazi),			Mus musculus ornithine decarboxylase antizyme inhibitor (Oazi), mRNA	BG088828	Mm.6775	Energy/Metabolism

2999	H3158C04	Mus musculus maternal embryonic message 3 (Mem3), mRNA			BG076315	Mm.1178	Matrix/Structural Proteins
3000							
3001	H3158C07						Heat Shock/Stress
3002							
3003							
3004	H3158E03	methylenetetrahydrofolate dehydrogenase (NAD+ dependent), methenyltetrahydrofolate cyclohydrolase (Mthfd2),	Mus musculus methylenetetrahydrofolate dehydrogenase (NAD+ dependent), methenyltetrahydrofolate cyclohydrolase (Mthfd2), mRNA		BG076333	Mm.443	Energy/Metabolism
3005							
3006	H3158F09	cDNA: FLJ22903 fis, clone KAT05624	Homo sapiens cDNA: FLJ22903 fis, clone KAT05624		BG088873	Mm.20841	Energy/Metabolism
3007							
3008	H3158F10	"Mus musculus Cc1h gene for chaperonin containing TCP-1 eta subunit, complete cds"			BG076350	Mm.28037	Heat Shock/Stress
3009							
3010	H3158G12	"Mus musculus metallothionein-like 5, testis-specific (tesmin) (Mtl5), mRNA"			BG076362	Mm.56287	Heat Shock/Stress
3011							
3012	H3158H01	"Mus musculus protein phosphatase 5 (PP5) mRNA, complete cds"			BG076363	Mm.3294	Signal Transduction
3013							
3014	H3159A03	Mm.10331				Mm.10331	Apoptosis
3015							
3016	H3159C05	"Mus musculus Rab3D (rab3d) gene, complete cds"			BG076387	Mm.29968	Signal Transduction
3017							
3018	H3159D05	"Homo sapiens phosphorylase kinase, beta (PHKB), mRNA"			BG088924	Mm.28827	Signal Transduction

3019		"Mus musculus phosphofructokinase-1 A isozyme (Pfka) mRNA, complete cds"		BG088948	Mm.26550	Signal Transduction
3020	H3159F12					
3021			Mus musculus glutathione S-transferase, mu 2 (Gstm2), mRNA	BG088952	Mm.14601	Energy/Metabolism
3022	H3159G05	glutathione S-transferase, mu 2 (Gstm2), cds"				
3023	P1G4	Ant 1				
3024	mFRDA	Fratxin		NM_008044		Energy/Metabolism
3025	mSOD2	Mn SOD (SOD2)		NM_013671		Energy/Metabolism
3026	P1G9	mtDNA-12s rRNA				
3027	P1G10	mtDNA-16s rRNA				
3028	P1H10	mtDNA-ATPase 6				
3029	P1H11	mtDNA-ATPase 8				
3030	P1G11	mtDNA-COX 1				
3031	P1G12	mtDNA-COX 2				
3032	P1H1	mtDNA-COX 3				
3033	P1H9	mtDNA-Cyt b				
3034	P1H2	mtDNA-NADH 1				
3035	P1H3	mtDNA-NADH 2				
3036	P1H4	mtDNA-NADH 3				
3037	P1H5	mtDNA-NADH 4				
3038	P1H6	mtDNA-NADH 4L				
3039	P1H7	mtDNA-NADH 5				
3040	P1H8	mtDNA-NADH 6				

Table 5

Num	Gene	Genbank Acc. #	IMAGE Clone ID	Unigene Cluster	Res. Gen.Clone
1	mtDNA-12s rRNA	V00711	In House-Clone		
2	mtDNA-16s rRNA	V00711	In House-Clone		
3	mtDNA-ATPase 6	V00711	In House-Clone		
4	mtDNA-ATPase 8	V00711	In House-Clone		
5	mtDNA-COX 1	V00711	In House-Clone		
6	mtDNA-COX 2	V00711	In House-Clone		
7	mtDNA-COX 3	V00711	In House-Clone		
8	mtDNA-Cyt b	V00711	In House-Clone		
9	mtDNA-NADH 1	V00711	In House-Clone		
10	mtDNA-NADH 2	V00711	In House-Clone		
11	mtDNA-NADH 3	V00711	In House-Clone		
12	mtDNA-NADH 4	V00711	In House-Clone		
13	mtDNA-NADH 4L	V00711	In House-Clone		
14	mtDNA-NADH 5	V00711	In House-Clone		
15	mtDNA-NADH 6	V00711	In House-Clone		
16	(2'-5')oligoadenylate synthetase 1	X04958, M33863	AI449562	Mm.14301	577664
17	14-3-3 protein beta	AF058797.1	AA624796	Mm.34454	1039350
18	14-3-3 protein epsilon	D87663.1	AA240827	Mm.678	670982
19	14-3-3 protein eta	U57311	AI325059	Mm.3308	558536
20	14-3-3 protein gamma	AF058799		Mm.10802	464892
21	14-3-3 protein theta (tau)	U57312	AA422980	Mm.14722	803843
22	14-3-3 protein zeta	U79231	AA671451	Mm.3360	1039129
23	25-hydroxyvitamin D3 24-hydroxylase precursor	D49438	AA240836	Mm.6575	657172
24	25-hydroxyvitamin D3 24-hydroxylase precursor	D49438	AI226268	Mm.6575	658678
25	2-amino-3ketobutyrate-coenzyme A ligase	AF093403	AI037094	Mm.18618	315143
26	2-oxoglutarate dehydrogenase E1 component	U02971	W98443		424460
27	3,2-trans-enoyl-CoA isom, mito precursor	Z14049	AI194961		1886651
28	38g cent.		In House-Clone		
29	3-beta hydroxy-5-ene steroid dehydrogenase type I	M27137	AA274685		766591
30	3-beta hydroxy-5-ene steroid dehydrogenase type II	M75886	AI266804	Mm.30433	1891212
31	3-beta hydroxy-5-ene steroid dehydrogenase type III	M77015	AA209060	Mm.335	676577
32	3-methyl-2-oxobutanoate dehydrogenase (lipoamide)	L16992		Mm.12819	422840
33	41.2a cent.		In House-Clone		
34	44b cent.		In House-Clone		
35	45.2b cent.		In House-Clone		
36	55e cent.		In House-Clone		
37	5-aminolevulinate synthase precursor (EST)	M15268	AA189529	Mm.1217	635215
38	65c cent.		In House-Clone		

39	66a cent.		In House-Clone		
40	67 cent.		In House-Clone		
41	a-amylase	V00719	AI325237	Mm.7074	608852
42	acetyl-CoA acetyltransferase 1	L42293		Mm.28099	472233
43	acetyl-CoA acetyltransferase 2	AF078751	AA239043		694062
44	Aconitase (iron responsive element)	X61147	AA212704		677092
45	Aconitase (iron responsive element)	X61147	AA238899		697949
46	Acyl-CoA dehyd, med-chain specific precursor (MCAD)	U07159	AA104184	Mm.10530	568149
47	Acyl-CoA dehyd, short-chain specific precursor	L11163	AI050239	Mm.18759	1379035
48	Acyl-CoA dehyd, very-long-chain specific precursor	U41497	AA250410	Mm.18630	670916
49	Acyl-CoA dehydrog, long-chain spec. precursor (LCAD)	U21489	AA254905	Mm.2445	719580
50	adapt		In House-Clone		
51	Adenine nucleotide translocator 2, fibroblast (Ant2)		AA033138.1		465520
52	adenylate kinase isoenzyme 2 (EST)	AI155541	AA061587	Mm.29460	483322
53	Adenylosuccinate synthase		AA388461		749837
54	adenylyl cyclase type VII	U12919	W65619		387280
55	ADP,ATP carrier protein, fibroblast isoform 2 (ant2)	U27316		Mm.658	585992
56	ADP,ATP carrier protein, heart isoform T1	U27315	AA717872	Mm.16228	1152250
57	adrenodoxin precursor	L29123	AA461849	Mm.1061	851558
58	Alcohol dehydrogenase 5		AA183192		636207
59	Alcohol dehydrogenase I		AA221141		695105
60	Aldehyde dehydrogenase	U07235	AA122975		579570
61	aldehyde dehydrogenase (NAD+) 2 precursor	U07235	AI503977	Mm.2621	1001020
62	Alpha-1 protease inhibitor	U38477	AA212578	Mm.16672	676745
63	Ant 1		In House-Clone		
64	Antioxidant protein 1	M28723	W91307		423832
65	Antioxidant protein 1	M28723		Mm.29821	599017
66	Antioxidant protein-2 (AO2)		AA243957	Mm6587	694088
67	Apoptosis inhibitor 2		AA144490		597715
68	Apoptosis inhibitor 3		AA097958		550702
69	apoptosis regulator BAX, membrane isoform alpha	L22472	AI323521	Mm19904	557643
70	Apoptosis-inducing factor	AF100927	AA866777		1434491
71	ASC		In House-Clone		
72	ATP synth lipid-binding protein P1 precursor (subunit 9)	L19737	AI481739	Mm.258	888863
73	ATP synthase A Channel	AA106406	AA106406	Mm.5293	519329
74	ATP synthase F0 component	L19737	AA139793		580898
75	ATP synthase F0 component		AA269701		735887
76	ATP/GTP binding protein		AA184876		642977
77	ATPase, Ca++ transporting, cardiac muscle, fast twitch 1		W34420.1		318735
78	ATPase, Ca2+ transporting, heart		W34420		318735
79	ATPase-like vacuole proton channel		AA276030		776055
80	ATP-binding cassette transporter 7	U43892	AU019072	Mm.4739	1920872

81	Bcl-2 protein	U10102	AA051441		478723
82	Branched chain alpha ketoacid dehydrog. Kinase			Mm.8903	578018
83	branched chain alpha-ketoacid dehyd chain E1-alpha	L47335		Mm.25848	314098
84	Branched-chain a-ketoacid dehydrog. E1b		AA050586		476163
85	Branched-chain amino transferase I		AA003372		426976
86	BZP		In House-Clone		
87	C II 3		In House-Clone		
88	C IV is		In House-Clone		
89	Calcium channel, voltage-dependent, L type, alpha 2 delta subunit		AA511037.1		890932
90	calm 1		In House-Clone		
91	Calmodulin 3		AA109041.1		571789
92	carbonate dehydratase, hepatic	X51971	AI256540	Mm.35538	1889415
93	Carbonic Anhydrase IV	U37091	AA71129	Mm.1614	1167078
94	carbonyl reductase (NADPH) - mouse	X07411, D26123	W11423	Mm.21454	317572
95	carnitine O-acetyltransferase (carnitine acetylase)	X85983	AI528757	Mm.20396	602213
96	carnitine O-palmitoyltransferase II precursor	U01163		Mm.29499	580316
97	Carnitine palmitoyltransferase 2			Mm.29499	580316
98	Caspase 2		AA200808		639403
99	Caspase I		AA098139		550766
100	Catalase		AA239490	Mm 4215	678773
101	CCAAT/enhancer binding protein (C/EBP), alpha		AA271223.1		738252
102	CEBP		In House-Clone		
103	Cellular apoptosis suscep. Protein		AA471761		874148
104	chaperonin-10	U09659		Mm.12970	422572
105	CI 18K		In House-Clone		
106	CI B8		In House-Clone		
107	col 1		In House-Clone		
108	col 3		In House-Clone		
109	coproporphyrinogen III oxidase precursor	D16333	W71884	Mm.35820	390487
110	coproporphyrinogen oxidase	D16333	AA108600		570602
111	coproporphyrinogen oxidase	D16333	AA259342		734795
112	coproporphyrinogen oxidase	D16333	W53951		367358
113	Core binding factor beta		AA146442.1		596552
114	creatine kinase	Z13968, Z13969	AA690010	Mm.970	1167886
115	Creatine Kinase, muscle	X03233	AA166212	Mm.2375	608246
116	Creatine kinase-complete	M74149	AA270310	Mm.16831	736251
117	Creatine kinase-mitochondrial	Z13968	AI528837	Mm.970	607301
118	cyt C oxydase polypeptide VIIa-liver/heart precursor	X58486	AA960158	Mm.2151	1248366
119	cyto C oxydase polypeptide VIa-heart precursor	U08439	AA415934	Mm.21050	846138
120	cyto C oxydase polypeptide VIa-liver precursor	L06465		Mm.19094	533628

121	cytochrome c oxidase chain IV precursor	X54691, M37829	AA260009	Mm.2136	746546
122	cytochrome c oxidase chain Va precursor	X15963	AI131665	Mm.360	1884978
123	cytochrome c oxidase chain Vb precursor	X53157	AI035302	Mm.16769	1432845
124	cytochrome c oxidase chain VIb (HUMAN)	NM_001863	AI503861		991287
125	cytochrome c oxidase chain VIc	M20153	AA062417		516889
126	cytochrome c oxidase chain VIIc	X52940	AA031250	Mm.14831	464966
127	cytochrome c oxidase chain VIII	U37721		Mm.14022	481408
128	Cytochrome C oxidase sub VII		AA050684		476180
129	cytochrome C oxydase polypeptide VIII-H precursor	U15541	AI323348	Mm.3841	463967
130	cytochrome C, somatic	X01756	AA221965	Mm.35389	658678
131	cytochrome C-type heme lyase (CCHL)	U36778		Mm.3988	400735
132	cytochrome-b5 reductase (HUMAN)	NM_000398	AA816039		1120651
133	CYTOSOLIC BRANCH CHAIN AMINOTRANSFERASE		AA286063		776036
134	DD 43		In House-Clone		
135	DD 47		In House-Clone		
136	DD 48		In House-Clone		
137	DD 53		In House-Clone		
138	DD 64		In House-Clone		
139	DD 68		In House-Clone		
140	DD 69		In House-Clone		
141	DD 73		In House-Clone		
142	DD 83		In House-Clone		
143	DD 84		In House-Clone		
144	DD10a		In House-Clone		
145	DD11b		In House-Clone		
146	DD14		In House-Clone		
147	DD15c		In House-Clone		
148	DD16c		In House-Clone		
149	DD17c		In House-Clone		
150	DD19a		In House-Clone		
151	DD23ba		In House-Clone		
152	DD24d		In House-Clone		
153	DD25c		In House-Clone		
154	DD26f		In House-Clone		
155	DD2a		In House-Clone		
156	DD33a/pgf		In House-Clone		
157	DD39		In House-Clone		
158	DD4c		In House-Clone		
159	DD7a		In House-Clone		
160	defender against cell death 1		AA033006		464622
161	DiGeorge syndrome chromosome region 6		W54234.1		356181
162	dihydrolipoamide dehydrogenase (E3) (HUMAN)	J03490	AA548170	Hs.74635	994825
163	dihydrolipoamide transacylase precursor	L42996	AA254971	Mm.3636	719973
164	Dimethyl glycine dehydrogenase		AA288418		748958
165	DNA polymerase gamma	U53584		Mm.3616	575332
166	Dynamin		AA266438		317587

167	Dynamin 2		W13111		457445
168	E1B 19k/Bcl-2-binding prot. Homolog (NIP3)		AA105295		571367
169	ER V		In House-Clone		
170	ERV-1	U40494	AI413376	Mm.28124	367232
171	EST highly similar to S-100 prot a-chain		AA466432		872869
172	ESTs		AA253853.1		660997
173	ESTs		AA268402.1		721970
174	ESTs		W14142.1		329863
175	ESTs, Highly similar to CREATINE KINASE, SARCOMERIC MITO. PRECUR.		AA038095.1		472860
176	ESTs, Highly similar to CREATINE KINASE, SARCOMERIC MITO. PRECUR.		AI322288.1		336085
177	ESTs, Highly similar to DERMATOPONTIN [Bos taurus]		W13931.1		330218
178	ESTs, Highly similar to MATERNAL EFFECT PROTEIN STAUFEN		AA104976.1		533314
179	ESTs, Highly similar to NADH-UBIQUINONE OXIDOREDUCTASE 13 KD-B SUB		AA288040.1		748891
180	ESTs, Highly similar to NADH-UBIQUINONE OXIDOREDUCTASE SGD SUB PREC.		AA222463.1		671212
181	ESTs, Highly similar to NUCLEAR FACTOR NF-KAPPA-B P100 SUBUNIT		AA060802.1		482952
182	ESTs, Highly similar to PINCH PROTEIN		AA289280.1		790449
183	ESTs, Highly similar to PTERIN-4-ALPHA-CARBINOLAMINE DEHYDRATASE		W14332.1		331681
184	ESTs, Highly similar to PUTATIVE REGULATORY PROTEIN TSC-22		W66757.1		387449
185	ESTs, Highly similar to SUCCINATE DEHYDROGENASE		AA108475.1		572339
186	ESTs, Highly similar to (define not available 4588044)		AA190123.1		642467
187	ESTs, Highly similar to putative ATP/GTP-binding protein		AA184876.1		642977
188	ESTs, Weakly similar to (define not available 3668141) [H.sapiens]		AA467585.1		833160
189	ESTs, Weakly similar to survival motor neuron [M.musculus]		AA538419.1		932748
190	ESTs, Weakly similar to vesicle membrane protein		AA259674.1		735186
191	Excitatory amino acid transporter 3	D43797	AA065502	Mm.24741	524046
192	ferredoxin--NADP+ reductase precursor	D49920	AA879949	Mm.4719	1230740
193	ferrochelatae precursor	M59288		Mm.1070	635652
194	Friedreich ataxia	S75712	AA930748		1150363
195	Fructose 1-6 bis-phosphate	D42083	AI385602	Mm.2974	336727
196	Fructose bis-phosphate aldolase	W53351	AI553136	Mm.7729	902910
197	Fructose Bisphosphate aldolase A	Y00516	AA518639		903419

198	Fuzzy onion homolog (mouse)		AA674474		1093002
199	GAMMA-ADAPTIN		AA238435.1		693837
200	GAPD		In House-Clone		
201	GILZ		In House-Clone		
202	Glutamate receptor, ionotropic, kainate 5 (gamma 2)		AA261334	Mm.2879	733368
203	Glutamate receptor, ionotropic, NMDA1 (zeta 1)		W44130	Mm.3292	354244
204	Glutamate receptor, ionotropic, NMDA2C (epsilon 3)		AI256808	Mm.39090	1852361
205	Glucose dependent insulinotropic polypeptide	U34295	AA871367	Mm.5115	1096156
206	Glucose Phosphatase Isomerase I complex	M14220	AA276216		776210
207	Glucose Phosphatase Isomerase I complex	M14220	W29397		337413
208	Glucose-6-phosphate isomerase	L09104	AI327180	Mm.589	437357
209	glutamate dehydrogenase (NAD(P)+) precursor	X57024	AA543797	Mm.10600	949005
210	glutamate oxaloacetate transaminase-2	X06917, J02622		Mm.18916	617490
211	Glutaryl-CoA dehydrogenase precursor (GCD)	U18992		Mm.2475	573351
212	Glutathione peroxidase-3 (plasma Gpx)	U13705	AA097557	Mm.7156	552393
213	Glutathione peroxidase-4 (phospholipid Gpx)		AA034666	Mm.2400	466963
214	Glutathione peroxidase-heart isoform (Gpx4)	AF045769.1	AI327053	Mm.2400	420345
215	Glutathione peroxidase-plasma isoform	U13705.1	AI042912	Mm.7156	1432410
216	Glyceraldehyde 3-phosphate dehydrogenase		AA122891		579715
217	Glycerol 3-phosphate acyltransferase	M77003	AA209041		676437
218	Glycerophosphate dehydrogenase	M13366	AI414023	Mm.10669	303389
219	Glycogen Phosphorylase (RAT)	J03080	AA240684		656882
220	GP4		In House-Clone		
221	Gpx		In House-Clone		
222	GTP2		In House-Clone		
223	GTP-binding protein		AA509565		890444
224	H+-transporting ATP synthase chain alpha	L01062	AI573940	Mm.4069	1920315
225	H+-transporting ATP synthase chain beta	AF030559	AI452208	Mm.17869	576006
226	H+-transporting ATP synthase chain delta (EST)	AA940343	AA896697	Mm.22514	1279053
227	H+-transporting ATP synthase chain e	U59283	AI115240		1885128
228	H+-transporting ATP synthase chain e	U59283	AI481625		876416
229	H+-transporting ATP synthase chain gamma	U43893	AA210528		640931
230	heat shock protein 60 precursor	X55023, X53584	AA154729	Mm.1777	540881
231	heat shock protein 70 precursor	D11089	AI132204	Mm.2849	1481709
232	heat shock protein, 70K (hsp68) (fragment)	M12573	AA647374	Mm.6388	1108306
233	Heat shock protein, 84 kDa 1	M18186		Mm.2180	538585
234	Hexokinase		W11571		318642

235	Hexokinase		W74835		389177
236	hexokinase I (3'-seq)	J05277	AI661880	Mm.5290	717383
237	hexokinase I (5'-seq)	J05277	AA197916	Mm.5290	654873
238	high mobility group protein homolog HMG4 (Hmg4) mRNA, complete cds		AA048831.1		478865
239	HK-40s Ribosomal protein S15		AA033398		466295
240	HK-40s Ribosomal protein S4		AA000082		425352
241	HK-A111Aciént ubiquinating protein		W82989		405768
242	HK-A16060s Ribosomal protein L15		AA068842		532770
243	HK-A17360s Ribosomal protein L3		AA108363		570533
244	HK-A21060s Ribosomal protein L1A		AA170607		619006
245	HK-A216RNA splicing protein		AA183061		636766
246	HK-A262E2F transcription factor		AA396123		751755
247	HK-A272Capping protein		AA414612		779754
248	HK-A316Actin-gamma (smooth muscle)	M26689	AA710883	Mm.16562	1166855
249	HK-A97Hypoanthine phosphoribosyl transferase	J00423	W48168	Mm.18675	355084
250	HK-Actin- alpha (skeletal muscle)	M12347	AI035279	Mm.4581	1480709
251	HK-Actin- gamma	M21495	AI314957	Mm.29913	192859
252	HK-Alkaline Phosphatase		AA032457		465052
253	HK-b-actin	X03672	AA079937	Mm.297	536615
254	HK-calcium binding protein Cab45	U45977	AI266799	Mm.30149	1891202
255	HK-DNA ligase I		W66626		388245
256	HK-Glyceraldehyde 3-phosphate dehydrogenase (G3PDH)	W14827	AA119563	Mm.5289	538210
257	HK-Glyceraldehyde phosphate dehydrogenase	M32599	AA466618	Mm.5289	817984
258	HK-HPRT		In House-Clone		
259	HK-Hypoanthine phosphoribosyl transferase	J00423	AI256193	Mm.18675	1890233
260	HK-Murine ornithine decarboxylase	M10624	AI325192	Mm.15259	608003
261	HK-Myosin 1	L00923	AI098184	Mm.3390	1481939
262	HK-Phospholipase A2 (14-3-3 zeta/delta)	D78647	AA1714341	Mm.3360	617315
263	HK-Ribosomal Protein S29	L31609	AA032465	Mm.35816	465138
264	HK-Ubiquitin	X51703	AI181949	Mm.235	1451597
265	House mouse; Musculus domesticus mRNA for LN1, complete cds		W82212.1		403728
266	Huntingtin	AI876894	AI876894	-----	1922060
267	hydroxymethylglutaryl-CoA lyase	S65036	AA838929		1261134
268	hydroxymethylglutaryl-CoA synthase, mitochondrial	U12790, U12791		Mm.10633	518481
269	IG ALPHA CHAIN C REGION		AA098196.1		551003
270	IMAGE EST		AA009059.1		441176
271	IMAGE EST		AA028306		464099
272	IMAGE EST		AA035899.1		468817
273	IMAGE EST		AA051664.1		479709
274	IMAGE EST		AA118290		574435
275	IMAGE EST		AA200984.1		639212
276	IMAGE EST		AA203878		640734
277	IMAGE EST		AA215024		652207
278	IMAGE EST		AA221250		670393
279	IMAGE EST		AA245545		699280

280	IMAGE EST		AA250652		697537
281	IMAGE EST		AA266097.1		716941
282	IMAGE EST		AA275684		775722
283	IMAGE EST		AA388512		790857
284	IMAGE EST		AA466026.1		809016
285	IMAGE EST		AA519027.1		904900
286	IMAGE EST		W08090.1		331768
287	IMAGE EST		W09924		315773
288	IMAGE EST		W09924.1		315773
289	IMAGE EST		W15031		330502
290	IMAGE EST		W41309.1		351420
291	IMAGE EST		W89418.1		420553
292	IMAGE EST- CCAAT enhancer binding protein		AA271223		738252
293	IMAGE EST-Glucocorticoid-induced leucine zipper GILZ protein		W66757		387449
294	IMAGE EST-homolog of Unc33 (C.Elegans) / Collapsin response mediated prot. 2		W08090		331768
295	IMAGE EST-sarcoplasmic creatine kinase		W18057		336085
296	IMAGE EST-Sim to gamma sarcoglycan		W41309		351420
297	IMAGE EST-yeast bile transporter		AA473289		803488
298	Interferon gamma receptor		AA541842.1		920516
299	Interleukin 1 receptor-associated kinase		AA276835.1		777580
300	isocitrate dehydrogenase (NADP)	U51167		Mm.2966	571468
301	Kin 17		In House-Clone		
302	Lactate Dehydrogenase-	M27554	AA880398		1277670
303	Lactate Dehydrogenase-A4	M17516	AI506641	Mm.26504	1024774
304	Lactate Dehydrogenase-sperm specific	M17587, L10389	AA110449	Mm.16563	516582
305	M.musculus mRNA for fibromodulin		W63981.1		374228
306	M.musculus mRNA for GTP-binding protein		AA020462.1		455401
307	MAD homolog 4 (Drosophila)		AA030901.1		466551
308	Malate dehydrogenase (cyto)		W13686		318346
309	Malate dehydrogenase (mito)	M16229	AA266087		717095
310	malate dehydrogenase precursor, mitochondrial	X07295, M16229		Mm.21743	407143
311	MAP KINASE PHOSPHATASE-1		AA125367.1		575665
312	Maternal embryonic message 3		AA388122.1		775464
313	MCK		In House-Clone		
314	mDP 6		In House-Clone		
315	metal response element DNA-binding protein M96 mRNA, complete cds		AA545607.1		945218
316	methylenetetrahydrofolate dehydrogenase (NAD+)	J04627		Mm.443	440345
317	methylmalonyl-CoA mutase alpha chain precursor	X51941		Mm.4299	571282
318	Microtubule-associated protein 4		AA003769.1		437523
319	Mito matrix prot P1 precursor (hsp60)		AA184322		633625
320	Mitochondrial LON protease	AA061310	AA061310	-----	514859
321	mitochondrial transcription factor A - mouse	U57939		Mm.276	539693

322	mitochondrial uncoupling protein	M21247	AI131780	Mm.4177	1498957
323	monoamine oxidase A - mouse	S78615	AI643185		864614
324	Mouse breast heat shock 73 prot (hsc73)	M19141		Mm.2944	538418
325	Mouse calcineurin catalytic subunit mRNA, complete cds		AA245461.1		699236
326	Mouse Circadian output locomotor cycles kaput	AF000998	AI156715	Mm.3552	1494023
327	Mouse heatshock protein 27	U03560.1	AA596241	Mm.13849	1052188
328	Mouse heatshock protein 86	J04633	AI649095		1970053
329	Mouse med. Chain acyl-CoA dehydrogenase	U07159	AA061679		483333
330	Mouse mHox protein	L06502	W17990	Mm.3869	335936
331	Mouse Skd3 mRNA	U09874		Mm.3990	602340
332	mRNA for sarco/endoplasmic reticulum Ca2+ -ATPase (SERCA2)		AA222567.1		695695
333	mTF 1		In House-Clone		
334	Mus musculus Balb/c zinc finger protein PZF (Pzf) mRNA, complete cds		W11161.1		316427
335	Mus musculus calcium-binding protein S100A1 mRNA, complete cds		AA466432.1		872869
336	Mus musculus cytoplasmic protein Ndr1 (Ndr1) mRNA, complete cds		AA473269.1		803416
337	Mus musculus FGF-binding protein (FGF-BP) mRNA, complete cds		AA403432.1		717457
338	Mus musculus GTP binding protein (GTP2) mRNA, complete cds		AA509565.1		890444
339	Mus musculus hemin-sensitive initiation factor 2 alpha kinase mRNA, complete cds		AA036546.1		466971
340	Mus Musculus mRNA for glutamate receptor channel alpha 4 subunit		AI043222	Mm.42021	1431493
341	Mus musculus mRNA for GM3 synthase, complete cds		AA274576.1		748275
342	Mus musculus PAF acetylhydrolase mRNA, complete cds		AI324436.1		536464
343	Mus musculus pantophysin gene, complete cds		AA271505.1		737944
344	Mus musculus rab6/rab5-associated protein (rab6) mRNA, partial cds		W77711.1		401958
345	Mus musculus skeletal muscle LIM protein (FLH1) mRNA, complete cds		AA047966.1		477066
346	Mus musculus Stra13 mRNA, complete cds		AA064241.1		480896
347	mWS3		In House-Clone		
348	Myeloid cell leukemia sequence 1	U35623, AF063886	AA387843	Mm.1639	761106
349	Myostatin		AA052179.1		418993
350	NAD(P)+ transhydrogenase (B-specific) precursor	Z49204	AI323702	Mm.3842	580717
351	NADH dehydrogenase mwfe		W83104		404499
352	NADH-ubiquinone oxidoreductase 13 kDa subunit	L38438	AA397301		599804

353	NADH-ubiquinone oxidoreductase 13 kDa subunit	U59509	AA035972		468848
354	NADP transhydrogenase	Z49204	AI323702	Mm.3842	580717
355	Nitric Oxide Synthase-2		AA512708	Mm2893	922250
356	Nitric Oxide Synthase-3		AA177240	Mm12837	620940
357	Nuclear respiratory factor-1	AF098077	AI594316		1006311
358	Nuclear respiratory factor-2	U20532		Mm.1025	635541
359	ornithine carbamoyltransferase precursor	X07092	AI266937	Mm.2611	1891345
360	ornithine--oxo-acid transaminase precursor	X64837	AI196410	Mm.13694	1887672
361	p63a		In House-Clone		
362	PACD		In House-Clone		
363	PEBP2		In House-Clone		
364	Peripheral myelin protein, 22 kDa		AA416246.1		846064
365	peripheral-type benzodiazepine receptor 1	U12419	AA068577		524463
366	Peroxisomal/Mitochondrial dienoyl-CoA isomerase	U01841	W34083	Mm.3020	317536
367	Peroxisomal/Mitochondrial dienoyl-CoA isomerase		W29607		338088
368	Phosphofructokinase 1	J03928, AF123533	AI480449	Mm.1166	862787
369	phospholipase A2, platelet, synovial fluid	X74266	AA871547	Mm.4675	1096251
370	phosphoprotein phosphatase	M81475	AI449151	Mm.1567	619279
371	PMP 35	L27842	AI573377	Mm.16453	534171
372	probable aconitate hydratase, mitochondrial (EST)	AI385870	AA275929	Mm.30065	775753
373	Procollagen Type 1		AA073604		536306
374	Procollagen, type I, alpha 1		AA073604.1		536306
375	Procollagen, type III, alpha 1		W89883.1		420322
376	Procollagen, type VI, alpha 1		W33786.1		352450
377	Protein Phosphatase inhibitor 2 (IPP2)	AA041826	AA041826	Mm.29617	475407
378	protoporphyrinogen oxidase	U25114, D45185		Mm.4730	482868
379	pyruvate carboxylase	L09192	AI303529	Mm.1845	1888741
380	Pyruvate decarboxylase		AA308254		473778
381	Pyruvate dehydrogenase	M76727	AA423301		820409
382	pyruvate dehydrogenase (lipoamide)	M76728	AI323722	Mm.4223	513684
383	pyruvate dehydrogenase (lipoamide)	M76727	AA466268	Mm.34775	888842
384	Pyruvate dehydrogenase E1 a subunit (human)	L13318	AA238899		888842
385	pyruvate kinase	D38379	AI035313	Mm.2635	1432851
386	Pyruvate kinase	D63764	AI195164	Mm.8359	1886895
387	Pyruvate kinase		AA475121		873690
388	Pyruvate kinase-like protein		W17814		334876
389	RAB1		In House-Clone		
390	RAB1, member RAS oncogene family		AA175510.1		619501
391	Rat NRBF1		AA259674		735186
392	Rnase P-complex (RS Williams work)	U31228	AI614577		523232
393	S100		In House-Clone		
394	sarc.		In House-Clone		
395	Sim to 6-Phosphofructo-2-kinase (human)	M19938	AA397024		693346

396	Sim to acetyl CoA acetyl transferase (hum)	D90228	AA272067		761668
397	Sim to acetyl Coenzyme A synthetase		AA109675		570550
398	Sim to acetyl Coenzyme A synthetase		AA537637		949423
399	Sim to a-ketoglutarate (hum)	D10523	W13320		329728
400	Sim to Aldehyde dehydrogenase (HUM)			Mm.24457	423605
401	Sim to arginyl-tRNA synthetase (Sac Cer)			Mm.22363	576572
402	Sim to ATP synthase epsilon (Bov)		AA108733		571214
403	Sim to ATP synthase F chain	PIR:A54211	W82194		403660
404	Sim to ATP synthase lipid binding (Hum)	X69908	AA239148		698109
405	Sim to b-enolase (human)	X56832	W11965		316967
406	Sim to branched-chain a-ketoacid dehydrogenase kinase	TR:G924921	AA059497		480575
407	Sim to carbon catabolite repressor prot. (Sac)		AA051133		438774
408	Sim to carbon catabolite repressor prot. (Sac)		AA404014		717197
409	Sim to carnitine/acylcarnitine carrier		AA245413		699181
410	Sim to citrate synthase (Por)		W14146		329884
411	Sim to cytochrome b5 (outer mito mem)		AA203975		640762
412	Sim to cytochrome c oxidase VI B (Hum)	X13923	AA139624		581175
413	Sim to cytochrome c oxidase VII	X80899	AA050684		476180
414	Sim to electron trans flavoprotein a sub (Hum)	J04058	AA060723		481934
415	Sim to electron trans flavoprotein b sub (Hum)	X71129	W18161		333641
416	Sim to enolase a subunit (Hum)	M14328	AA204262		643854
417	Sim to Fructose 1-6-bisphosphate (Hum)	L10320	AA276043		776124
418	Sim to glucose dehydrogenase (Bac. Sub)		AA241896		680935
419	Sim to Glutamate/Malate trans (BOV)			Mm.28466	582075
420	Sim to Glutathione-S-transferase (RAT)			Mm.27395	317849
421	Sim to glycerol 3-phosphate dehydrogenase 1 (rat)		W41175		351221
422	Sim to glycogen phosphorylase (Hum)	J03544	W16286		334236
423	Sim to hepatocyte gluc transporter		AA002666		426758
424	Sim to mito RNA pol (HUM)		AI892781	Mm.34645	608625
425	Sim to Mito. 2-oxoglutarate/malate carrier (Human)	X66114	W54000		367801
426	Sim to mito. Elongation factor TS (Bov)		AA245481		699237
427	Sim to NADH-ubiquin. oxidoreduct. 13 kd sub.		AA288040		748891
428	Sim to NADH-ubiquin. oxidoreduct. 49 kd sub.		AA109715		572585
429	Sim to NADH-ubiquin. oxidoreduct. 9 kd sub.		AA521758		903911
430	Sim to NADH-ubiquin. oxidoreduct. ashl.		W83085		404593
431	Sim to NADH-ubiquin. oxidoreduct. b14 sub.		AA462323		871020
432	Sim to NADH-ubiquin. oxidoreduct. B14.5 sub.		W54068		367925
433	Sim to NADH-ubiquin. oxidoreduct. b15 sub.		AA434897		818906

434	Sim to NADH-ubiquin. oxidoreduct. b17 sub.		W54448		367651
435	Sim to NADH-ubiquin. oxidoreduct. b22 sub.		AA415725		846155
436	Sim to NADH-ubiquin. oxidoreduct. b9 sub.		W83574		406509
437	Sim to NADH-ubiquin. oxidoreduct. Kfy1		W97248		423071
438	Sim to NADH-ubiquin. oxidoreduct. mn11 sub.		AA267638		723360
439	Sim to NADH-ubiquin. oxidoreduct. sgdh sub.		AA222463		671212
440	Sim to NADH-ubiquin. oxidoreduct.15 kd sub.		AA014507		439668
441	Sim to putative mito. Ribosomal prot. S14		W89487		419614
442	Sim to quinone oxidoreductase		AA241313		653324
443	Sim to quinone oxidoreductase		AA259674		735186
444	Sim to serine hydroxymethyltransferase, mito. (Rab)		AA208877		676311
445	Sim to sterol 26 hydroxylase			Mm.26793	578465
446	Sim to succinate dehydrogenase	M32246	AA108475		572339
447	Sim to TIM17		W11644		318134
448	Sim to Translocase of inner mito. mem. (Tim 44) (Sac)	Q01852	AA498767		888708
449	Sim to ubiquinol-cty c reductase		AA087137		493604
450	Sim to ubiquinol-cty c reductase, core prot.		AA108590		572127
451	Sim to UDP-glucose dehydrogenase		AA067191		523796
452	Sim to UTP-Gluc.-1-phosphate uridyltrans (Human)	TR:G881394	AA473123		805218
453	Sim to yeast ORF(Sim to rat synaptic glycoprotein) / SURF 4		AA220458		695279
454	SKD 3		In House-Clone		
455	Skel Mus LIM protein (FHL1) / RPB-assoc. mol. RAM14-1		AA047966		477066
456	SMCK		In House-Clone		
457	SMOO		In House-Clone		
458	Solute carrier family 2	X15684	AA275871		776543
459	Sperm capsule seleno protein	M88463	AA497767		917403
460	sperm mitochondrial capsule selenoprotein	S49657, M29603	AI482284	Mm.554	917537
461	steroidogenic acute reg protein precursor, mito	L36062	AA389406	Mm.3436	569013
462	sterol carrier protein 2 precursor	M62361		Mm.1779	580813
463	Succinate dehydrogenase-Cyt B560	TR:G1019861	AA137762		580040
464	superoxide dismutase (Mn) precursor	Z18857, L35525	AA415267	Mm.2597	791140
465	Superoxide dismutase-1 (Cu/Zn Sod)		AA039044	Mm5274	474545
466	Superoxide dismutase-3 (extracellular Sod)		AI314465	Mm2407	1907770
467	Suppressor of Ty 6 (S. cerevisiae) homolog		AI323032.1		477535
468	Surfeit gene 4		AA220458.1		695279

469	Surfeit locus protein 1	M14689	AA274488	Mm.6874	748268
470	tetrahydrofolylpolyglutamate synthase precursor	U32197	AA030778	Mm.3830	463571
471	Thioredoxin		AA242573		681159
472	Thioredoxin			Mm.3533	579774
473	Thioredoxin Reductase		AI529082	Mm.25543	1887250
474	thiosulfate sulfurtransferase	U35741	AI196763	Mm.15312	1887427
475	Thiosulfate sulfurtransferase (mito) Tst1	U35741	AI195057	Mm.15312	188763
476	TIMP2		In House-Clone		
477	Tissue inhibitor of metalloproteinase 2		AA444490.1		831964
478	Tissue inhibitor of metalloproteinase 2		AA518165.1		902923
479	TOAD		In House-Clone		
480	transforming protein bcl-2-alpha	L31532	AA867214	Mm.5155	1265430
481	transforming protein bcl-2-beta	M16506	AA867214		1265430
482	transforming protein bcl-w (3' seq)	AF030769.1	AA563148		975210
483	transforming protein bcl-w (5'-seq)	AF030769.1	AA667328		1139352
484	Transketolase (Tkt)	U05809	AI132421	Mm.9307	1481358
485	Type II Peroxiredoxin 1		W83228	Mm42948	405943
486	Uncoupling Prot homology (UCPH)		AA260521		748122
487	Uncoupling Protein 2			Mm.12556	423616
488	Uncoupling protein 3		AA062091		482847
489	Unknown EST				608265
490	uracil-DNA glycosylase	U55040	W48179		355462
491	voltage-dependent anion channel 1	U230840	AA244874		680076
492	voltage-dependent anion channel 2	U30838	AI507203	Mm.569	931442
493	voltage-dependent anion channel 3	U30839	AA616007	Mm.38513	1066900

Example 3

Identification of Mutations Causing Disease

The mitochondrial respiratory complex I is assembled from seven mtDNA genes and thirty-six nDNA genes. Patients with complex I defects have phenotypes ranging from midlife-onset optic atrophy to lethal childhood Leigh's disease. Mitochondrial biology expression profiles were determined for patients with a variety of complex I defects. Samples are collected from a variety of patients with complex I defects. Each sample is reverse transcribed, labeled, and hybridized, together with standard target, to a human array comprising probes selected from Example 1. The hybridization measurements are analyzed, leading to the identification of several novel mtDNA mutations and dominant and recessive nDNA mutations.

Example 4

Profile for Complex IV Leigh's Syndrome

The mitochondrial biology expression profile was determined for a complex IV Leigh's syndrome (LS) patient. LS is a subacute neurodegenerative condition characterized

by necrotic lesions in the brain stem, basal ganglia, thalamus and spinal cord. Death is usually within 2 years of onset of symptoms that may include motor and/or intellectual retardation, abnormal breathing rhythm, nystagmus, ophthalmoparesis, optic atrophy, ataxia, and dystonia. The Leigh's syndrome patient had a typical complex IV cytochrome c oxidase deficiency associated with surfeit 1 (SURF-1) gene mutations. This patient was from a consanguineous marriage and was homozygous for a nonsense mutation in the SURF-1 gene. Expression profiling of muscle and cultured cell samples from this patient using a human array of Example 1 was performed, in comparison to a control reference standard. NDUFS8 expression was not significantly altered. However, many nuclear and mitochondrially encoded complex I genes were down-regulated, including mtDNA transcripts ND4, ND4L, and ND6. Nuclear genes SURF-1, SOD2, 70kD heat shock protein, voltage dependent anion channel (VDAC4), adenine nucleotide translocase 2 (ANT2), and glutathione peroxidase 3 were down-regulated.

Example 5

Profile for Complex I Leigh's Syndrome

Mitochondrial biology expression profiles were determined for twelve complex I Leigh's syndrome patients (Procaccio, VF (2001) EuroMit5 Abstract). Sequencing of all 43 genes known to be part of complex I, of each patient, identified one patient as a compound heterozygote for two missense mutations in the 23 kD NADH dehydrogenase (NDUFS8) gene of complex I. This patient had a respiratory complex I defect apparent in skeletal muscle and cultured lymphoblastoid cells. Samples were collected from cultured lymphoblastoid cells from this patient and control reference lymphoblastoid cells. Samples were reverse transcribed and differentially labeled and hybridized to a human array comprising probes selected from Example 1. The expression profile was determined using a hierarchical clustering method. Mitochondrial biology expression profiles from the other patients were similarly determined using appropriate samples and controls. Expression profiles of all patients were characteristic of complex I deficiencies, including down-regulation of all mtDNA and some nDNA complex I genes and up-regulation of the adenine nucleotide translocator genes (ANT1 and ANT2).

Example 6

Diagnosis of Complex IV Leigh's Syndrome

The mitochondrial biology expression profile for Leigh's syndrome SURF-1 nonsense mutations, as determined in Example 4, is used to diagnose patients. Samples are collected from patients and mitochondrial biology expression microarray-tested using a human array containing probes for at least SURF-1, ND4, ND4L, ND6, SOD2, 70kD heat shock protein, VDAC4, ANT2, and glutathione peroxidase 3.

Example 7

A Mouse MitoChip

A mouse Mitochip was printed with probes for 452 genes. Some of these genes were represented by two or more probes, providing internal controls for the reproducibility of gene expression quantitation. An additional 37 control spots were included on the array. Of these, 25 were probes for housekeeping genes to allow normalization between samples. The remaining 12 spots were various controls for hybridization and positioning. Table 2 lists the functional categories and number for all of the housekeeping genes on this array. The cDNA clones that represent each gene were either from the I.M.A.G.E. consortium or cloned by The Center for Molecular Medicine and published in (Murdock et al., 1999). A complete annotation of each gene was compiled and GenBank accession numbers and Unigene cluster numbers were determined. Table 5 provides a list of the probes on this array.

Example 8

Profile of Sod2 Heterozygote Mutant Mice at Various Ages

Oxidative stress has been implicated in aging and degenerative disease. Mitochondria are thought to be the main source of reactive oxygen species such as superoxide anion. Mitochondrial superoxide anion is normally detoxified by manganese superoxide dismutase (MnSOD, the Sod2 gene). However, when, free radical metabolism is perturbed, oxidative damage to protein, DNA, and lipids may occur. To demonstrate the effects of increased superoxide anion toxicity on mitochondrial physiology with age, the mitochondrial biology expression profiles of mice with a 50% reduction in MnSOD (Sod2 +/-) were determined at various ages. Samples were collected from young (5 months), middle-aged (10-14 months), and old (20-25 months) wild-type and Sod2 +/- mice. Samples were reverse transcribed and differentially labeled from the corresponding controls. The labeled mutant sample and the corresponding labeled control were hybridized with the mouse array of Example 2. Relative

to the control mice, the old Sod2 +/- mice showed induction of antioxidant and apoptosis genes including glutathione peroxidase 3, apoptosis inhibitory factor 3, caspase 1, and the peripheral benzodiazepine receptor.

Example 9

Profile of Sod2 Homozygote Mutant Mice

Manganese superoxide dismutase (MnSOD, the Sod2 gene) is a gene expression product involved in mitochondrial biology. Sod2 -/- animals die soon after birth due to the superoxide inactivation of mitochondrial iron-sulfur center enzymes resulting in dilated cardiomyopathy. The mitochondrial biology expression profile of Sod2 -/- mice is determined using the mouse MitoChip of Example 2. RNA samples are collected from Sod2 -/- mice and Sod2 +/+ mice. The Sod2 -/- sample is reverse transcribed and labeled with Cy3 phosphoramidite. The Sod2 +/+ sample is reverse transcribed and labeled with Cy5 phosphoramidite. The labeled samples are incubated with a mouse array under conditions of high stringency hybridization. The hybridization of both samples is measured with a microarray reader. The hybridization measurements are recorded.

Example 10

Profile of GPx1 Mutant Mice

Glutathione peroxidase 1 (GPx1) is an expressed sequence involved in mitochondrial biology. GPx1 -/- animals show mild growth inhibition and reduced OXPHOS efficiency. The mitochondrial biology expression profile of GPx1 -/- mice is determined using a mouse array of Example 2. RNA samples are collected from GPx1 -/- mice and GPx1 +/+ mice. The GPx1 -/- sample is reverse transcribed and labeled with Cy3 phosphoramidite. The GPx1 +/+ sample is reverse transcribed and labeled with Cy5 phosphoramidite. The labeled samples are incubated with a mouse array under conditions of high stringency hybridization. The hybridization of both samples is measured with a microarray reader. The hybridization measurements are recorded.

Example 11

Profile of Sod2 Heterozygote GPx1 Homozygote Doubly Mutant Mice

The mitochondrial biology expression profile of Sod2 +/- plus GPx1 -/- mice is determined using a mouse array of Example 2. RNA samples are collected from Sod2 +/- plus GPx1 -/- mice and Sod2 +/+ plus GPx1 +/+ mice. The Sod2 +/- plus GPx1 -/- sample is

reverse transcribed and labeled with Cy3 phosphoramidite. The Sod2 +/+ plus GPx1 +/+ sample is reverse transcribed and labeled with Cy5 phosphoramidite. The labeled samples are incubated with a mouse array under conditions of high stringency hybridization. The hybridization of both samples is measured with a microarray reader. The hybridization measurements are recorded.

Example 12

Profile of Mutant Mice Overexpressing Sod2 and/or GPx1

The mitochondrial biology expression profiles are determined using a mouse array, for mice overexpressing MnSOD and for mice overexpressing MnSOD plus GPx1.

Example 13

Profile of ρ^0 Mutant Cell Line

A mouse array of Example 2 was used to determine the mitochondrial biology expression profile of the mouse mutant cell line ρ^0 , the most extreme case of mitochondrial dysfunction. The LMEB4 (ρ^0) cell line was profiled against its parental LM(TK) - cell line. The mouse mutant cell line ρ^0 lacks mitochondrial DNA. To maintain the LMEB4 cell line in culture, it must be grown in media supplemented with glucose, pyruvate, and uridine (GUP media). A scatter plot of the gene expression ratios is shown in FIG. 3. Samples from the ρ^0 cell line and from the LM(TK) cell line were reverse transcribed and differentially labeled using a standard two-color fluorescent system, and hybridized to a mouse array of Example 2. Mouse array analysis confirmed that all mtDNA-encoded transcripts were absent from the LMEB4 cells, and that there was a reduction in nDNA OXPHOS gene expression, aconitase, and nuclear receptor binding factor 1 (NRBF1). There was an increase in expression of key glycolytic genes, mitochondrial ribosomal proteins, the LON protease, heat shock protein 84 (HSP 84), Bcl-X binding protein, and antioxidant protein 1. Invariably, the nuclear-encoded OXPHOS complex subunits were also down-regulated between 3 and 38-fold with a mean of 4.5 (the mean was calculated excluding the single outlying complex I subunit NADH-dehydrogenase *mwfe* which was down-regulated 38-fold). Mitochondrial transport proteins such as the Glutamate-malate transporter were down-regulated as was the mitochondrial protein import subunit gene Tim17 and several amino acid metabolism genes. By contrast, glycolytic genes such as pyruvate kinase, glucose phosphate isomerase and glucose-6-phosphate dehydrogenase were up-regulated 2 to 3-fold. Phosphofructokinase was up 1.6-fold. Anti-apoptotic genes such as apoptosis inhibitor 2 and 3 were up-regulated as was the

pro-apoptotic Bcl-Xs binding protein BNIP3 and Caspase 2. The other Bcl protein family members that are on the array were not changed significantly. The multi-function mitochondrial LON protease was up-regulated 2.1-fold.

Example 14

Profile of CAP^R Mutant Cell Line

A mouse array of Example 2 was used to determine the mitochondrial biology expression profile of the mouse mutant cell line harboring a mutation for chloramphenicol resistance (CAP^R), and the CAP^R 501-1 cell line having a mtDNA mutation in the 16S rRNA gene. The CAP^R mutation in chimeric mice causes cataracts, reduced photoreceptor response, vacuolization of the retinal pigment epithelium, and hamartomatous outgrowths of the optic nerve head. Mice inheriting the CAP^R mutation showed a marked increase in embryonic lethality, and those that were born died within two weeks with growth retardation, dilated cardiomyopathy, and mitochondrial abnormalities. CAP^R 501-1 was compared to the CAP^S LM(TK) - cell line. These two cell lines are both derived from mouse L929 cells. Samples from the CAP^R cell line and from wild-type cells were reverse transcribed and differentially labeled with a standard two-color fluorescent system, and hybridized to a mouse array of Example 2. The CAP^R cell line had up-regulation of all thirteen mtDNA transcripts, but down-regulation of multiple nDNA OXPHOS genes. The CAP^R 501-1 cell line versus the LM(TK)- gene expression scatter plot showed that all mtDNA transcripts were up-regulated 3.1 to 3.5-fold while the nuclear encoded OXPHOS subunits were down-regulated 2.1 to 5.3-fold. Procollagen type III and VI were also up-regulated 3.5 to 4-fold.

Example 15

Profile of Treatment to Cell Line

Mouse arrays of this invention were used to demonstrate how treatment changes, such as changing cell culture conditions, affect gene expression. The control cell line LM(TK) - grown in standard medium was profiled against a culture of LM(TK) - cells grown in media supplemented with glucose, pyruvate, and uridine (LM(TK) - (GUP)). Samples from the treated fibroblast cell line and from untreated fibroblast cells were reverse transcribed and differentially labeled with a standard two-color fluorescent system, and hybridized to a mouse array of Example 2. Treatment resulted in a down-regulation of the LON protease and HSP 84. The scatter plot of this experiment showed that other than the same core group of genes that were up-regulated in the NZB cell line mentioned in Example 17, few genes were

significantly different in their expression. The hybridization spots of three genes that showed the highest differences were HSP70, the LON protease, and E.T.F. The 70 kDa heat shock protein (HSP70) was down-regulated 3.4-fold. HSP70 has been shown to be a chaperone protein involved in mitochondrial protein import that forms an ATP-dependent motor with the inner mitochondrial membrane translocase and the polypeptide in transit (Voos, W. et al., "Mechanisms of protein translocation into mitochondria," [1999] *Biochimica et Biophysica Acta* 1422:235-54). The entire HSP70 control spot was of medium intensity, while the experimental spot was only medium intensity in the center. The LON protease was down-regulated 9.7 fold in LM(TK) - cells grown in GUP. The control LON protease spot was of medium high intensity over the entire spot and of low intensity in the experimental spot. The electron transfer flavoprotein (ETF), which shuttles electrons gathered during fatty acid metabolism to the electron transport chain, was down-regulated 3.8 fold. The E.T.F control spot was high intensity and the experimental spot very low intensity. Some of the nuclear encoded OXPHOS subunits as well as several proteins involved in amino acid metabolism were down-regulated 1.5 to 2-fold with mean ratio of 1.65. Since most of these genes fell below the +/- 1.7 ratio cutoff, further analysis was needed to determine if the expression pattern was significant. There were no differences in mtDNA transcript levels and no consistent pattern of up-regulation of glycolytic genes.

Example 16

Profile of Sod2 Mutant Mice After Treatment and Before Symptoms

Treatment of Sod2 mutant mice with MnTBAP prevents cardiac and liver pathology, however after 12 days the MnTBAP-treated mutant animals develop a prominent movement disorder which leads to debilitation by three weeks, in association with spongiform changes and gliosis in the cortex and specific brain stem nuclei associated with motor function. It is thought that the severe neuropathology results from poor exchange of MnTBAP across the blood brain barrier. The mitochondrial biology expression profile of MnTBAP-untreated, Sod2 mutant mice and MnTBAP-treated, Sod2 mutant mice was determined using the mouse array of Example 2. Samples were collected from 8 day old Sod2 mice without MnTBAP treatment, 8 day old Sod2 mice with MnTBAP treatment, and 12 day old Sod2 mice with MnTBAP treatment. Samples were also collected from age-matched controls. About 20 genes were found to be differentially expressed in all three groups of Sod2 knockout mice compared to the corresponding age-matched controls. The about 20 genes included bioenergetic genes such as the mitochondrial creatine phosphokinase, antioxidant enzymes

like the glutathione peroxidase 3, and apoptotic factors including caspase 1 and apoptosis inhibitor factor 3. The excitatory amino acid transporter 3, frataxin, and one EST of unknown function were also induced. Mitochondrial biology expression profiling demonstrated changes in expression before neuropathic changes were manifested.

Example 17

Organ-Specific Profiles of Mutant Mice

The NZB mouse line mtDNA and the "common haplotype" mtDNAs (129/Sv, C57Bl/6J, C3H, BALB/c, and others which are thought to have arisen as the progeny of a single female (Ferris et al., 1982) differ by 108 nucleotides, and these polymorphic differences have been used to monitor the segregation of heteroplasmic populations of mtDNAs in mice created by embryo fusion techniques (Jenuth, J. P. et al., "Random genetic drift in the female germline explains the rapid segregation of mammalian mitochondrial DNA," [1996] *Nat Genet* 14:146-51; Jenuth, J. P. et al., "Tissue-specific selection for different mtDNA genotypes in heteroplasmic mice," (1997) *Nat Genet* 16:93-5; Meirelles, F.V., and Smith, L.C., "Mitochondrial genotype segregation in a mouse heteroplasmic lineage produced by embryonic karyoplast transplantation," (1997) *Genetics* 145:445-51; Meirelles, F.V. and Smith, L.C., "Mitochondrial genotype segregation during preimplantation development in mouse heteroplasmic embryos," [1998] *Genetics* 148:877-83). Tissues from the NZB and CAP^R mice were profiled on a mouse array. Messenger RNA was isolated from the brain, liver, spleen, kidney, heart, and skeletal muscle of a male mouse heteroplasmic for the NZB mtDNA and a male mouse that was 80% chimeric for ES cell-derived CAP^R cells as defined by coat color. Due to the severity of the CAP^R mutation it was not possible to analyze the mitochondrial gene expression changes in mice that were homoplasmic for the CAP^R mtDNA. Control mRNA for each of the tissue samples was isolated from sex, age, and nuclear background-matched control mice. All of the tissue samples were genotyped to determine the levels of heteroplasmy for the NZB and CAP^R mtDNA in each of the tissues. Equal levels of the NZB and "common" mtDNA were found in the six tissues analyzed from the NZB mtDNA-positive mice. The six tissues from the CAP^R chimera had varying levels of CAP^R mtDNA with the kidney and spleen having the highest amounts, 65% and 50% CAP^R mtDNA, respectively. The heart contained approximately 20% CAP^R mtDNA, while brain, liver, and muscle all contained between 5% and 10% CAP^R mtDNA. Analysis of the NZB-mtDNA tissue samples did not reveal any differentially expressed genes in the heart, liver, brain, and kidney. A scatter plot from the NZB heart is shown in FIG 4. The scatter

plots from the liver, brain, and kidney are virtually identical in that nearly every gene has an expression ratio of 1. Analysis of the NZB-mtDNA spleen and muscle showed several genes that were differentially expressed in the two tissues. The NZB-mtDNA muscle showed a 1.5 to 2.1-fold reduction in all mtDNA transcripts, pyruvate dehydrogenase was down 2.2-fold, and there was a general trend for nuclear-encoded OXPHOS subunits to be down-regulated 1.4 to 1.8-fold. The vesicular transport protein, pantophysin, was down-regulated 4-fold and the glycogenolysis rate-limiting enzyme, glycogen phosphorylase, was down 3-fold. There were not any genes that were significantly up-regulated in the muscle. A similar pattern of mtDNA-encoded gene expression was observed in the NZB-mtDNA spleen with all transcripts down 1.8 to 2-fold. However, there were no differences in nuclear OXPHOS subunit expression levels like that observed in the NZB-mtDNA skeletal muscle. In contrast to the NZB-mtDNA muscle, several genes were up-regulated in the spleen. In direct opposition to the results in the NZB cell line, both probes of the heme biosynthesis gene coproporphyrinogen oxidase III detected up-regulation 3-fold in the spleen. The integral membrane protein SURF 4 was up 2-fold and the amino acid metabolism gene 2-amino-3-ketobutyrate CoA ligase was up 4.8-fold. Glycogen phosphorylase, down 3-fold in the muscle, was up 4.8 fold in the spleen. The muscle and spleen results suggest that the polymorphisms between the NZB and "common" mtDNA may have a functional consequence in some tissues but not others. Analysis of the CAP^R tissue samples did not show any genes to be differentially expressed in the kidney, heart, muscle, liver, or spleen. The kidney, having the highest percentage of mutant mtDNAs, had expression ratios around 1 for nearly every gene. The two outliers on the kidney scatter plot that appear to be down-regulated can be explained by hybridization artifacts causing a high background in the control sample. The CAP^R brain sample was the only tissue that had any differentially expressed genes. Skd 3 was up-regulated 2.2-fold, glutathione peroxidase was up 2.4-fold and apoptosis-inhibitor 3 was up 2.4-fold. Although no genes were down-regulated in the brain more than 1.8-fold, closer analysis of the brain samples did reveal a trend that was not observed in any of the other tissues. Several nuclear-encoded OXPHOS subunits were down-regulated between 1.3 and 1.6-fold. These included five Complex I subunits, three Complex IV subunits and five Complex V subunits as well as VDAC 1 and 3. None of the Complex II and III subunits or mtDNA transcripts followed this trend. Principal component analysis of NZB and CAP^R mouse tissues, separately and together with the cell lines, was performed.

Example 18

Identification of Genes for Mitochondrial Arrays

Mice mutant in mitochondrial biology were used to identify genes involved in mitochondrial biology. Mice deficient in the heart/muscle isoform of the adenine nucleotide translocator (ANT1) exhibit many hallmarks of human oxidative phosphorylation (OXPHOS) disease, including dramatic proliferation of skeletal mitochondria. Samples were collected from the gastrocnemius muscle of ANT1 and wild-type mice, reverse transcribed and differentially labeled, and hybridized with a mouse microarray chip (Mouse Unigene 1, Incyte Genomics Inc., Palo Alto, California) containing over 8000 sequence-verified cDNAs. Analysis of the hybridization results identified more than 150 differentially expressed genes. Gene sequences that were not previously recognized as being involved in mitochondrial biology were used to generate probes that were placed on the mouse array of Example 2. Homologous human gene sequences were used to generate probes that were placed on the human array of Example 1.

Example 19

Profile of Age-Related Changes in Chimpanzee Using Human Mitochondrial Array

Age-related changes in the mitochondrial biology expression profile in chimpanzees are determined using a human array of Example 1. Samples from young adult chimpanzee muscle and samples from most-mortem tissues of older chimps are reverse-transcribed, differentially labeled, and hybridized with a human array of Example 1.

Example 20

Profile of Putative Neutral Variant Mutant Mouse

The NZB cell line was profiled to examine the changes in mitochondrial gene expression resulting from a more neutral set of mtDNA polymorphisms. As mentioned previously, the NZB mtDNA contains 108 sequence differences compared to the "common" mouse mtDNA genotype found in LM(TK). While these differences were reported to be neutrally polymorphic (Jenuth et al., [1996] *Nature Genetics* 14:146-151; Meirelles and Smith [1997] *Genetics* 145:445-451), the only evidence to support that hypothesis is that transgenic mice containing a high percentage of NZB mitochondria have no overt phenotypes (Levy, S. E., "Genetic Alteration of the Mouse Mitochondrial Genome and Effects on Gene Expression," (2000) Ph.D. Thesis, Emory University; Jenuth et al. [1997] *Nature Genetics* 16:93-95; Meirelles and Smith [1998] *Genetics* 148:877-883). An NZB cybrid cell line was

profiled on a mouse mitochondrial array. The scatter plot of gene expression ratios between the NZB cell line and the parental LM(TK) - (without GUP supplementation) shows that both probes of the fatty acid metabolism gene Acyl-CoA dehydrogenase (medium-chain) detected up-regulation 3.6-fold. Procollagen III and VI were up-regulated 6.2 and 6.8-fold, respectively. Two independent probes of the coproporphyrinogen oxidase III gene that is involved in heme biosynthesis detected down regulation 2.6 and 2.3-fold. Also down-regulated was the peripheral-type benzodiazepine receptor. This receptor has been implicated in a variety of mitochondrial functions including the regulation of mitochondrial protein import under conditions of oxidative stress, calcium homeostasis, and steroidogenesis (Culty, M. et al., "In vitro studies on the role of the peripheral-type benzodiazepine receptor in steroidogenesis," [1999] *J. Steroid Biochemistry & Molecular Biology* 69:123-30; Wright, G., and Reichenbecher, V. "The effects of superoxide and the peripheral benzodiazepine receptor ligands on the mitochondrial processing of manganese-dependent superoxide dismutase," [1999] *Experimental Cell Research* 246:443-50). The glycolytic genes glyceraldehyde-3-phosphate dehydrogenase and glucose-6-phosphate isomerase were up-regulated 1.7 and 2.1-fold, respectively. Glycolytic genes were also up-regulated in the NZB cell line. This indicates that the sequence polymorphisms between the NZB and "common" mtDNAs are not entirely neutral and cause changes in mitochondrial function when combined with the LM(TK) - nucleus. Thus, the NZB mtDNA does not appear to be completely interchangeable with the "common" mtDNA genome. An interesting group of genes that were up-regulated in the NZB cell line were the pro-inflammatory genes Caspase 1 and platelet activating factor (PAF) acetylhydrolase, the mitochondrial RNA polymerase, and glutathione peroxidase 3.

Example 21

Hierarchical Clustering of Cell Lines

Principal component analysis (PCA) and hierarchical clustering were performed on the cell line data (Examples 13-15 and 20) to group genes based on similarities in their expression patterns over all the samples. PCA analysis was used to reduce the dimensionality of the data by calculating three principal axes that encompass as much of the variability in all of the samples as possible. Each of the samples was then plotted on those axes in three-dimensional space. The PCA results revealed that the NZB cell line clustered away from the other cell lines, consistent with it having fewer differentially expressed genes in common with the other samples. The LMEB4 p0, 501-1 and LM(TK) - (GUP) cell lines all arrayed

along one common principle axis, probably due to the commonality of a down-regulation of nuclear OXPHOS genes. However, they were divergent in the other two axes. The LM(TK) - (GUP) and NZB did share one axis, possibly due to a partial reduction in OXPHOS genes and a concomitant induction of glycolytic gene expression. However, both showed few differences when compared to the CAP R 501-1 and LMEB4 p0 samples. A hierarchical clustering algorithm was used to group genes with similar expression profiles across all of the samples. Both genes as well as samples were clustered together using a Euclidean distance measurement and average linkage. The clustering results revealed seven groups of genes with similar expression patterns in the cell line samples. Certain classes of genes were found to change together. Similar to the PCA analysis, the expression changes seen in the LM(TK) - (GUP) and NZB samples clustered closest together with the CAP R 501-1 and LMEB4 p0 samples branching successively further away. The Group 1 genes are involved in fatty acid metabolism. Group 2 genes, mainly down-regulated in the LM(TK) - (GUP) sample, include malate dehydrogenase, lactate dehydrogenase, glucose phosphate isomerase, and several amino acid metabolism genes. Group 3 genes are diverse clusters of genes that change in expression coordinately across the 5 samples. It includes some nuclear-encoded OXPHOS subunits, a few antioxidant and transport proteins as well as pyruvate kinase and a GTP-binding protein. Group 4 is a small, diverse cluster of genes mainly up-regulated in the CAP R 501-1 cell line. This group includes several of the same genes found to be up-regulated in the Ant1(-/-) mouse by differential display analysis (Murdock et al., 1999). Also in this group are two NADP-transhydrogenases, carbonate dehydratase and cytochrome b5 reductase. Group 5 is almost exclusively nuclear-encoded OXPHOS subunits. The voltage-dependent anion channel (VDAC) genes and several antioxidant proteins also cluster in this group. Group 6 is composed almost entirely of mtDNA-encoded transcripts. Group 7 is the heterogeneous group of genes that were up-regulated in each of the samples analyzed and included Caspase 1, PAF acetylhydrolase, the mitochondrial RNA polymerase, and glutathione peroxidase 3. Hierarchical clustering packages are available in the art, i.e. Expression Profiler (<http://ep.ebi.ac.uk/EP/> from the European Bioinformatics Institute, Cambridge, UK). PCA is described in Bioinformatics 2001, volume 17, number 9, pages 763-774.

The following examples describe the preparation of a mitochondrial biology expression array, sample preparation, hybridization, scanning, and data normalization.

Example 22

PCR Amplification

PCR amplifications were performed with standard PCR techniques. Probes were made by amplifying clones using a universal primer set (Forward primer 5'-CTGCAAGGCG ATTAAGTTGGGTAAC-3' Reverse primer 5'-GTGAGCGGATAACAATTTTCAC ACAGGAAACAGC-3') in a 100 µl PCR reaction containing PCR buffer (10 mM Tris, 1.5 mM MgCl₂, 50 mM KCl, pH8.3), 0.2 mM dNTPs, 0.2 mM each primer, 1.25 U Taq (Sigma, St Louis, MO). 0.5-1 µl of bacterial culture was added to each PCR reaction and thermal cycling was done as follows: 4 minutes at 94 C followed by 35 cycles of 15 seconds at 94 C, 30 seconds at 66 C and 1 minute 30 seconds at 72 C. Following cycling, reactions were held at 72 C for 4 minutes to complete all extension reactions. All PCR products were confirmed by agarose gel electrophoresis through a 1.5% gel. After satisfactory amplification, products were quantitated by UV 260/280 ratio and desiccated in a Savant Speed-Vac (Holbrook, NY). Dried products were then resuspended in 3xSSC (450 mM NaCl, 40 mM sodium citrate) at a concentration of 400-600 ng/µl for arraying.

Example 23

Slide Preparation

Before arraying probes, the glass microscope slides for the arrays were coated with poly-Lysine to provide a substrate for DNA binding. Standard glass microscope slides (Gold Seal, Beckton-Dickson, Franklin Lakes, NJ) were cleaned in a solution of 2.5 M NaOH, 60% ethanol for two hours. After cleaning, slides were rinsed five times in fresh water. The slides were then soaked in a solution of 0.01% poly-L-lysine, .1x PBS for 1 hour followed by rinsing in fresh water. After rinsing, the slides were dried in a vacuum oven at 45°C for 15 minutes.

Example 24

Printing

Arrays were printed onto poly-L-lysine coated glass slides using the GMS 417 Arrayer (Affymetrix/Genetic Microsystems, Woburn, MA). The arrays were printed using a 4-pin print head with a spot size of 150 µm (approximately 33 pL of volume per spot) and a center-to-center spot spacing of 375 µm. A humidity level of 65-70% was maintained during the printing of the arrays by a custom humidifier system. After printing, the arrays were

allowed to dry for 1 hour at room temperature. The arrays were then processed by rehydrating over a warm solution of 1x SSC for 5 minutes followed by rapid drying on a 95°C heat block. Following drying, the DNA was crosslinked to the slide by exposing the arrays to 65 mJ of ultraviolet energy (Stratalinker, Stratagene, La Jolla, CA). To block non-specific interactions on the arrays during hybridization, the slides were then treated with a solution of 60 mM succinic anhydride and 40 mM sodium borate in 1-methyl-2-pyrrolidinone for 15 minutes at room temperature. The arrays were then denatured in 95°C water for 2 minutes and dehydrated by rapid immersion in 95% ethanol. The arrays were then dried by centrifugation at 20xg for 5 minutes.

Example 25

Sample Preparation

Total RNA preparations were performed using the TRIzol reagent (Life Technologies, Gaithersburg, MD) as per the manufacture's directions. For cell culture samples, a 90% confluent 225ml flask was lysed directly in the flask with 18 ml of TRIzol. At least three flasks were pooled for each cell line to reduce any variability caused by culture conditions. For each mouse tissue, RNA was isolated from approximately 500 mg of tissue that was mechanically homogenized in 6ml of TRIzol. Following the isolation of total RNA, poly-A+ mRNA was isolated using Qiagen Oligotex (Valencia, CA) as per the manufacture's directions.

Example 26

Reverse Translation, Labeling, and Hybridization

To produce targets for hybridization to the MitoChip arrays, 2 µg of poly-A+ RNA was labeled with fluorescent nucleotides by reverse transcription. The poly-A+ RNA was mixed with 3 mg of anchored oligo-dT and incubated at 70°C for 10 minutes followed by 10 minutes on ice. The denatured and annealed RNA was then reverse transcribed in a 30 µl reaction mix containing reaction buffer (50 mM Tris-HCl, 75 mM KCl, 3 mM MgCl₂ pH 8.3), 10 mM dithio-threitol, 500 µM dATP, dGTP, dTTP, 300 µM dCTP, 20 U SuperScript reverse transcriptase (Life Technologies, Gaithersburg, MD) and 100 µM of either Cy5-dCTP (control samples) or Cy3-dCTP (experimental samples). The reactions were incubated at 42°C for 2 hours. Following incubation, 15 µl of 0.1M NaOH was added to degrade the remaining template RNA and the sample incubated at 70°C for 10 minutes. The reaction was neutralized by the addition of 15 µl of 0.1 M HCl followed by 440 µl of TE buffer (10 mM

Tris, 1 mM EDTA, pH 7.4). The synthesized cDNA was purified by size-exclusion filtration using Microcon YM-3 centrifugal filter devices (Millipore, Bedford, MA). After purification, 10 µg of poly-A RNA (Sigma, St Louis, MO) and 10 µg of yeast transfer RNA (tRNA) (Life Technologies, Gaithersburg, MD) was added. The final sample volume was adjusted to 12 µl and 525 mM NaCl, 52.5 mM sodium citrate, 0.25% SDS. The sample was denatured at 100°C for 2 minutes and added to the array. The sample and the array were hybridized under high stringency hybridization conditions. The sample and array were covered by a 22 mm x 22 mm coverslip and placed in a humidified hybridization chamber (Corning, Acton, MA) and incubated at 65°C for 12-16 hours. Following hybridization, the arrays were washed with successive 5-minute washes in 2xSSC, 0.1%SDS; 1xSSC; and 0.1xSSC. After the final wash, the arrays were dried by centrifugation at 20xg and scanned using the GMS 418 Array Scanner (Affymetrix/Genetic Microsystems, Woburn, MA).

Example 27

Array Scanning and Data Analyses

Scanned arrays were saved as 16-bit TIFF files and analyzed using Biodiscovery's Imagen software (Los Angeles, CA). Data mining and clustering analysis was performed using Biodiscovery's GeneSight software. Prior to data analysis, all cell culture samples were normalized using all spots on the array. All mouse tissue samples were normalized to the housekeeping genes on the mouse array. Local background was calculated for each individual spot and any spot with a signal intensity less than 3 times over background or that had poor morphology was excluded from the data analyses. Only differential expression values of greater than 1.7 were considered significant. All data mining and clustering analysis performed using GeneSight was on expression ratio data that was transformed by taking the natural log (ln) of all values and normalized by Z-score. The data is transformed because of the non-Gaussian distribution of the expression ratio values. Because the ratios are bounded on the lower limit by zero, a non-Gaussian distribution is normally observed. To allow for additional statistical manipulations, the data was transformed for a more uniform distribution. The Z-score normalization method involved subtracting the mean from every observation and dividing by its standard deviation, effectively normalizing each spot to all other spots on the array.

Example 28

Sample Hybridization to Mitochondrial Array

Control cDNA samples were prepared from mRNA isolated from the LM(TK) - cell line and labeled with the Cy5 dye. Each experimental mRNA sample was labeled with the Cy3 dye, combined with the Cy5 control sample and the mixture used to hybridize the array. A representative image of a hybridized array is shown in FIG 2. Any spot on an array that appeared red was due to hybridization of a large proportion of the Cy5-labeled control LM(TK) - sample and any sample that was green was due to the hybridization of a large proportion of the Cy3-labeled experimental sample. Any spot that is yellow is an about equal co-hybridization of the two targets. The fluorescence ratio was quantitated for each spot, permitting calculation of the relative abundance of each gene's mRNA in the two samples.

Example 29

Normalization

The two fluorescent dyes that were used to label the cDNA produced during the reverse transcription of the mRNA have different structures and different emission maxima. Therefore, the two images that represent the hybridization of each of the fluorescently labeled samples were normalized to each other to account for the differences in dye behavior prior to calculating the expression ratios between the two images. One image was normalized to the other by averaging all of the spots in each image to derive a constant that was then applied to each spot. Alternatively, a predetermined set of genes that were expressed equally in the two samples under all conditions could have been used. The expression ratios of these genes were used to calculate a constant that was then applied to all spots on the array. A set of 25 housekeeping genes in Table 2 was included on a mouse array for normalization and both of these methods were used in the analysis of the mouse cell line and tissue samples. Housekeeping gene expression in the cultured cells was much more variable than in the tissue samples. Because of the variability in the housekeeping gene expression patterns in the cell line samples, normalization was done using all of the spots on the array. The expression of the housekeeping genes was much more consistent in the tissue samples and normalization using either the housekeeping genes or the average of all of the genes gave similar results.

Example 30

Clones useful for making control probes for the arrays of this invention are listed in Table 6. Sequences of the genes useful for making the control probes are provided in the sequence listings hereof.

Table 6

SEQ ID NO.	Gene Name	Complete Gene Name	GenBank Accession No.
3041	Beta Actin	Human beta actin	X63432
3042	Plant control CAB	Arabidopsis photosystem I chlorophyll a/b binding protein	X56062
3043	Plant control rbcL	Arabidopsis ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit	U91966
3044	Plant control RUBISCO	Arabidopsis RUBISCO activase	X14212

It will be appreciated by those of ordinary skill in the art that samples, sample collection techniques, sample preparation techniques, probes, probe generation techniques, genes involved in mitochondrial biology, hybridization techniques, array printing techniques, physiological conditions, cell lines, mutant strains, organisms, tissues, solid substrates, and methods of data analyses other than those specifically disclosed herein are available in the art and can be employed in the practice of this invention. All art-known functional equivalents are intended to be encompassed within the scope of this invention.

REFERENCE TO SEQUENCE LISTINGS

Tables 3-5 list sequence information on the clones that are useful for making probes for practicing the methods of this invention. Clone identification numbers are usually from NIA (National Institutes of Aging, National Institutes of Health, Bethesda, MD, USA), ResGen Invitrogen (Carlsband, CA, USA) or IMAGE Consortium, LLNL (Livermore, CA, USA). Gene names and descriptions are provided for the gene interrogated by a probe made from the corresponding clone. GenBank Accession Number and Unigene Cluster ID are provided where available. The functions of certain genes are included in Table 4. Sequences of the 5' and 3' ends of the clones listed in Tables 3-4 are provided when available. If no 5' or 3' sequence was available, gene sequence from the GenBank Accession No. provided for that clone is listed in some cases. The GenBank sequence may be larger than the sequence of the clone. The instant invention may be practiced without the sequence information provided

herein using the clones or GenBank listings. Other sequences derived from the genes interrogated by probes generated from clones listed in Tables 3-5 are useful for making equivalent probes using information known in the art, i.e., unique segments of such genes may be used.

The sequence listings that correspond to the clones listed in Table 3, covering human probes SEQ ID NOS:1-994, contain information including: the sequence identification number; a GenBank Accession No. corresponding to the listed sequence or the gene interrogated by the probe containing the listed sequence; another GenBank Accession No. in parentheses which is associated with the listed sequence in Table 3; a Research Genetics (ResGen Invitrogen, Carlsbad, CA, USA) Clone ID No. identifying the clone from which the sequence was derived; the name of the gene from which the clone was derived; a description of the gene; the Unigene Cluster ID No. of the gene; the IMAGE Clone ID No., which is often the same as the ResGen Clone ID No., and information in parentheses identifying the sequence as 5' or 3' of the clone; the length of the insert of the clone; the source of the clone; the type of clone, such as cDNA; and the nucleic acid sequence.

Sequence listings for control probes are provided as SEQ ID NOS:3041-3044.

The sequence listings that correspond to the clones listed in Table 4, covering mouse probes SEQ ID NOS:995-3040, contain information including: the sequence identification number; a GenBank Accession No. corresponding to the listed sequence; the 5' and/or 3' sequence of the corresponding clone, or the gene from which the corresponding clone was derived; the name and description of the gene from which the corresponding clone was derived; the Unigene Cluster ID No. of the gene from which the corresponding clone was derived; the name of the clone from which the instant sequence was derived; additional description of the gene; a set of titles usually including Clone Name, Rearray Sequence, Parent Sequence, Other EST, and Blast Link; a list of names including, in order of the above-mentioned titles, the name of the clone from which the sequence was derived, the name of the sequence with a suffix identifying it as the 5' (-5) or 3' (-3) sequence of the clone, the name of the parent sequence, and the name of another EST (expressed sequence tag), if it exists, which would be the other of the 3' or 5' sequence; the length of the sequence provided; and the nucleic acid sequence.

SEQ ID NOS:1-3044 are submitted herewith on a compact disk in file
"Sequence Listing.txt" which is incorporated herein by reference.

CLAIMS

We claim:

1. An array comprising at least two isolated nucleotide molecules, each molecule having a sequence capable of uniquely hybridizing to a nucleic acid molecule which is an expression product of a gene involved in mitochondrial biology.
2. An array comprising two or more isolated nucleic acid molecules or spots, each spot comprising a plurality of isolated nucleic acid molecules, each molecule having a sequence consisting essentially of a sequence selected from the group consisting of the sequences of human probe set #1, SEQ ID NOS: 1 to 994, or mouse probe set #2, SEQ ID NOS: 995 to 3040, and sequences having at least 70% homology to the foregoing sequences.
3. The array of claim 2 printed on a glass slide.
4. The array of claim 2 comprising more than about ten spots.
5. The array of claim 2 comprising more than about twenty-five spots.
6. The array of claim 2 comprising all of the isolated nucleic acid molecules having the sequences of human probe set #1, SEQ ID NOS: 1 to 994.
7. The array of claim 2 comprising all of the isolated nucleic acid molecules having the sequences of mouse probe set #2, SEQ ID NOS: 995 to 3040.
8. The array of claim 2 also comprising one or more spots comprising control nucleic acid molecules, SEQ ID NOS:3041-3044.
9. A method for determining an expression profile of a sample containing nucleic acid comprising:
 - a) providing the sample;
 - b) providing an array of claim 2;
 - c) contacting said array with said sample under conditions allowing selective hybridization; and

- d) measuring hybridization of nucleic acid in said sample to said array to produce an expression profile.
10. The method of claim 9 wherein said sample is from a mouse or a human.
11. A method for determining an expression profile of a first labeled sample containing nucleic acid relative to a second, differently labeled sample containing nucleic acid comprising:
- a) providing the first labeled sample;
 - b) providing the second, differently labeled sample;
 - c) providing an array of claim 2;
 - d) contacting the array with the first sample and the second sample under conditions allowing selective hybridization;
 - e) measuring hybridization of said first and said second samples to said array; and
 - f) comparing the hybridization of said first sample to the hybridization of said second sample to produce an expression profile.
12. The method of claim 11 wherein said second sample is a reference or a standard.
13. A method for determining an expression profile diagnostic of an energy-metabolism-related physiological condition comprising:
- a) providing a labeled first sample from a first group of one or more individuals with said physiological condition;
 - b) providing a differently labeled second sample from a second group of one or more individuals without said physiological condition;
 - c) providing an array of claim 2;
 - d) contacting the array with the first sample and the said second sample under conditions allowing selective hybridization;
 - e) measuring hybridization of said first and said second samples to said array; and
 - f) comparing the hybridization of said first sample to the hybridization of said second sample to produce an expression profile diagnostic of said physiological condition.

14. A method of making an array comprising:
 - a) providing a prepared substrate; and
 - b) printing two or more spots in known positions on said substrate, each spot comprising a plurality of isolated nucleic acid molecules, each molecule having a sequence consisting essentially of a sequence selected from the group consisting of human probe set #1, SEQ ID NOS: 1 to 994, mouse probe set #2, SEQ ID NOS: 995 to 3040, and sequences having at least 70% homology to the foregoing sequences.
15. The method of claim 14 wherein said array comprises all of said isolated nucleic acid molecules in human probe set #1, SEQ ID NOS: 1 to 994.
16. The method of claim 14 wherein said array comprises all of said isolated nucleic acid molecules in mouse probe set #2, SEQ ID NOS: 995 to 3040.
17. A method of diagnosing a first individual with Complex IV Leigh's Syndrome comprising detecting in a first sample from said first individual at least about a 1.7-fold decrease in the amount of expression of genes comprising ND4, ND1, ND6, SURF-1, SOD2, 70kD heat shock protein, VDAC4, ANT2, and glutathione peroxidase 3 compared to the amount of expression of said genes in a second sample from a second individual without Complex IV Leigh's Syndrome.
18. A library of at least two isolated nucleic acid molecules, each molecule having a sequence consisting essentially of a sequence selected from the group consisting of human probe set #1, SEQ ID NOS: 1 to 994, mouse probe set #2, SEQ ID NOS: 995 to 3040, and sequences having at least 70% homology to the foregoing sequences.
19. An array comprising at least two spots, each spot comprising a plurality of isolated nucleic acid molecules, each molecule comprising a sequence with at least 70% homology to a sequence selected from the group consisting of human probe set #1, SEQ ID NOS: 1 to 994.

20. An array comprising at least two spots, each spot comprising a plurality of isolated nucleic acid molecules, each molecule comprising a sequence with at least 70% homology to a sequence selected from the group consisting of mouse probe set #2, SEQ ID NOS: 995 to 3040.

FIG. 1

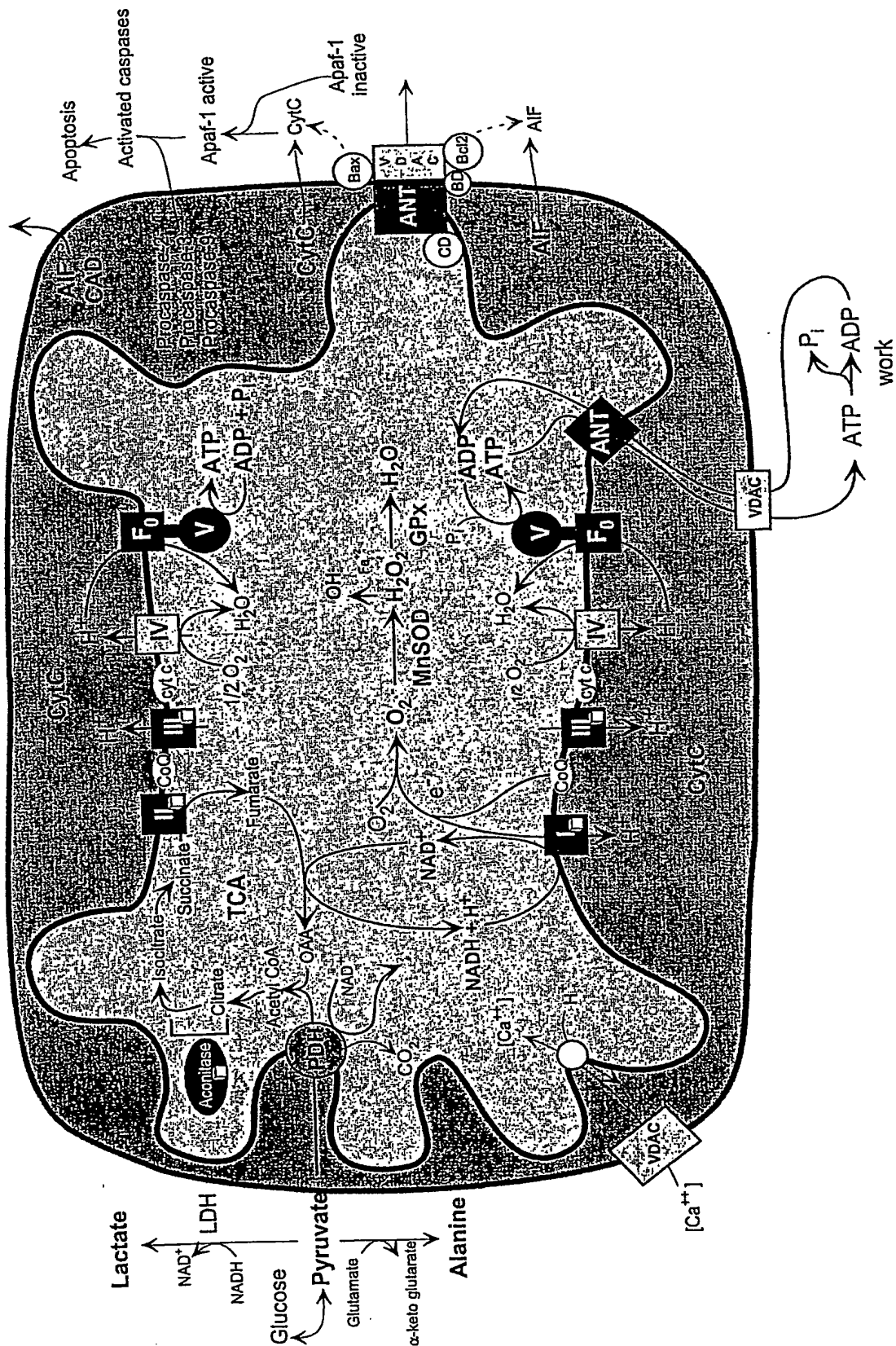


FIG. 2

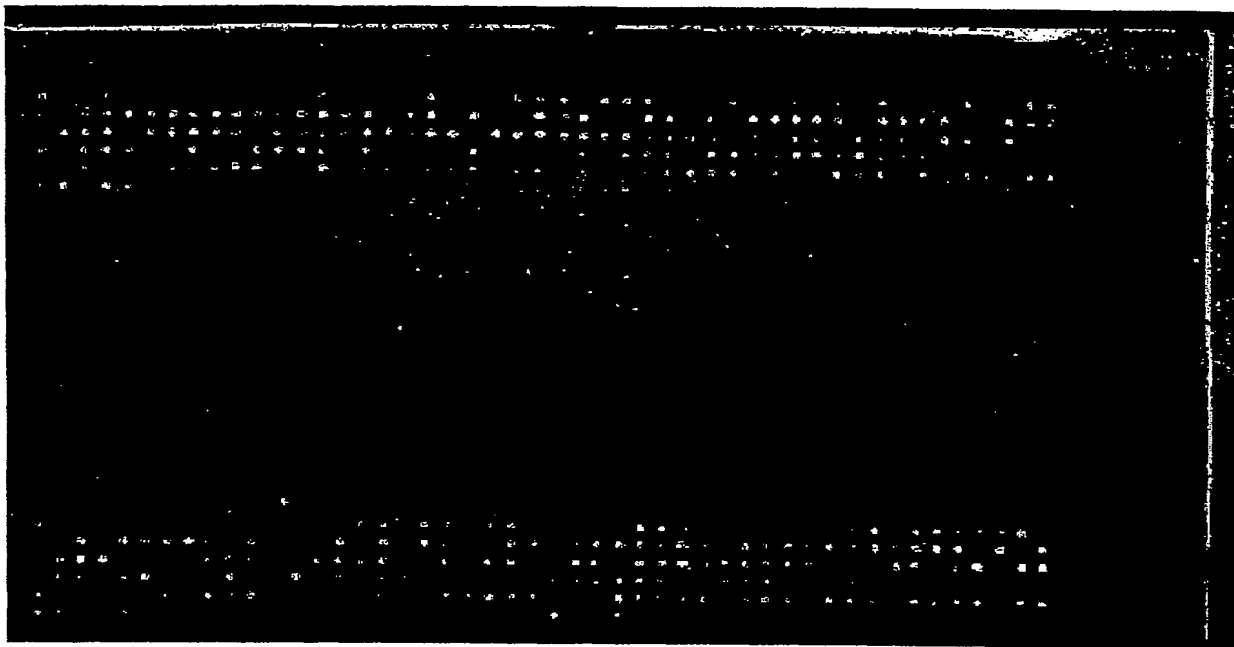


FIG. 3

